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Editor

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Endowment of Technical Education

THE news of the week was notable in technical circles for the announcement of George Eastman's latest gift to the Massachusetts Institute of Technology. Both are to be congratulated: Mr. Eastman for his outstanding success in a branch of the chemical industry that has enabled him to give intelligent expression to his generosity, and the Institute on the opportunity afforded by the endowment to advance the cause of engineering education. Other endowments have been made in larger measure, but Mr. Eastman's benefactions are of peculiar interest to technical men, representing, as they do, the fruits of chemical technology in industry.

Safety for Safety's Sake

SOME TIME ago in these columns we commented on the fact that reducing the fire risks in chemical plants often paid immediate dividends in the form of lower insurance rates. Since then a representative of the National Fire Protection Association has quite rightly called attention to the fact that fire safety—that is, the reduction of wastes by fire—is of far greater importance than the trivial saving in insurance premiums.

Our correspondent makes the point that the insurance companies are but the collectors and distributors of the fire tax, which is borne by the public at large. Improvements in a plant for the sole purpose of reducing insurance rates, while commendable, are always secondary in their importance from the viewpoint of precaution. The manufacturer must realize that no insurance on his physical property will adequately compensate him for the loss caused by a serious fire. Maintenance of good will and the value of a going business are not to be compared with the damages recoverable in the event of a conflagration that interrupts production. Too many manufacturers have thought themselves "fully covered by insurance" only to meet with disasters that have proved death blows to their business prospects.

The value of safety in fire prevention in the chemical plant does not admit of argument, and this the manufacturers have almost universally recognized. In fact, it is often the case that in extra-hazardous operations, such as those in many of our industries, the greatest precautions are observed. As a result fires do not occur frequently, and when they do occur, they can often be extinguished with small loss. On the other hand, new processes sometimes involve inherent hazards that are not appreciated until a serious disaster has forced the issue to the manufacturer's attention. After such unfortunate occurrences unnecessarily stringent regulations are sometimes made by the local authorities, and these severely hamper the manufacturer, who might have avoided the trouble had he given more thought to the fire hazard when developing the new process.

Fire prevention is an old story, but it is an important story that will bear much repeating. All of the chemical engineering industries can profitably afford to give it constant study in relation to their individual production problems.

Something For Nothing

THERE is an old hoax that is constantly appearing in new disguises. Trying to get something for nothing seems to be a natural—and in some cases an entirely harmless—occupation for some people. But when that something happens to be highly valuable technical information obtained from an equipment manufacturer under the guise of prospective purchase, there is a legitimate cause for complaint. Furthermore such a practice may have a serious effect on industrial development, as may be seen in the several experiences of one maker of specialized chemical equipment.

The manner in which the game has been played shows little variation except in fine detail. Pretending to be genuinely interested in the purchase of new apparatus, the advice and estimates of the logical builder have been sought. Almost invariably in the course of subsequent negotiations valuable hints are dropped by the specialist, or he may even go so far as to lay out a preliminary solution of the problem in hand. At this point the suave prospect retires to give the proposition due consideration. Perhaps later a letter drifts in to the engineers who have done the work, stating that in one way or another a different solution has been developed. This usually means that with the benefit of sponged information the supposed client believes himself able to tackle the problem on his own resources and to have his equipment made in a local foundry or by jobbing builders. Needless to say, the immediate result is seldom satisfactory from any point of view.

It is far from our purpose to disparage the technical ability or ingenuity of the chemical engineer in operating or development work. Yet it must be recognized that if he is to handle problems of a nature that requires outside advice, this should be solicited as such and paid for as consulting service. Parading under false colors to obtain assistance without paying for it is likely to prove a boomerang in the long run. Rather than be trapped repeatedly by fake clients, some equipment manufacturers are practically refusing to handle special business for small concerns unless ample proof of good faith is produced when negotiations are opened.

As usual, the innocent suffer with the guilty. The

field of promising activity for the equipment builder is narrowed and the results of his specialized experience and the co-operation that might be available for a reasonable fee are withheld altogether. In the interest of industrial progress, if not for ethical reasons, the business trickster must be eliminated and consulting relations between manufacturer and client put on a basis of sound business practice.

Muscle Shoals In the Senate

BEFORE the Senate adjourned last fall it agreed that the matter of Muscle Shoals should be taken up at the opening of the present session "and not laid aside until finally disposed of." He would be a rash prophet who would attempt to forecast what the Senate's final disposition will be, but judging from current debate the matter is receiving more businesslike consideration than in the past. The withdrawal of the Ford offer did more than anything else to take the subject out of the realm of politics. So, despite the conflicting views now being expressed, action by the Senate is assured.

Legislative action, however, does not necessarily imply intelligent disposition of the properties. There are still too many prescriptions for the patient's ills to make us feel confident in his ultimate recovery. Senator Norris is pressing his bill for federal operation and control of both the power and nitrate plants, insisting on the production of cheap fertilizer materials. Senator Underwood has offered a substitute based on the fact that Muscle Shoals was originally dedicated to fixation of nitrogen for the production of explosives in war and fertilizer in peace. He draws a rather fine, sentimental distinction between the other "power" bills and his own "national defense-fertilizer" bill. He would lease the power and nitrate plants under substantially the terms of the Ford bill, but if a lessee cannot be secured before July 1, 1925, he would proceed with operation by a federal corporation. Thus both the Norris and Underwood bills head toward government operation.

Against this the President has expressed the opinion that the field of nitrogen fixation is "better suited to private enterprise than to government operation." And Senator Wadsworth has vigorously denounced the whole idea of government operation as "hopeless in the matter of efficient management." A government corporation, in his judgment, will either become a huge political organization with employment obtained through political influence, or, if the corporation is put under civil service rules, its management will have lost the valuable and necessary privilege of engaging and dismissing employees at pleasure.

From an economic point of view Senators Norris and Underwood and even the President are pursuing an erroneous theory—namely, the possibility of fixing nitrogen by legislation. In one breath the President recognizes the fact that fixation of nitrogen on a commercial scale is better suited to private enterprise than to government operation, but in the next he favors a lease of the nitrate plants "under rigid guarantees of commercial nitrogen production at reasonable prices for agricultural use." Nothing could be more fantastic, for if nitrogen can be fixed commercially at reasonable prices for the manufacture of fertilizer it will be done without the necessity of rigid guarantees. If it cannot, the guarantees are useless. Short of a government subsidy, nitrogen will not be fixed unless it can be produced at a profit. Certainly it will not be fixed by the legislative process.

So we return to those principles that seem to us fundamental in the whole Muscle Shoals controversy. First, the distinction between the power project and the war-time nitrate plants. The two are not essentially related as far as future disposition is concerned. They might well be disposed of to separate organizations—power and chemical—each of which would make the best use of the respective properties under lease from the government. Second, the futility of requiring a performance of uneconomic proposals on nitrogen fixation, and third, the undesirability of what Senator Wadsworth characterizes as "the whole vice of government operation." With a nitrogen industry already established and expanding in this country, the government had best keep out of the business and lease its properties to those who know how to run them economically.

More Evidence That the Seed Is Sprouting

IT IS encouraging to have further proof that chemical technology is rapidly extending its influence to every type of industrial activity. The records of one of the largest chemical engineering research laboratories in this country show that on the average fully one-half of the problems come without solicitation from organizations outside the field of chemical industry or of industries that are ordinarily spoken of as chemically controlled. For example, during the past year the clientèle of this particular laboratory has included manufacturers of electrical specialties, automobiles, lace curtains, textile machinery, pressed fiber goods and a number of laundries.

To us it seems that the industries just cited are leading the way to increased efficiency in production through chemical technology intelligently applied to problems common to nearly every plant—efficient combustion of fuel, proper lubrication of machinery, control of the purity and hardness of water supply and prevention of corrosion. Every plant has one or more of these problems of major importance, and the wise industrial executive of today is learning that chemical technology and increased profits go hand in hand.

Coal Users, Take Notice!

DURING the coal shortage of 1922 the Interstate Commerce Commission established a priority order giving preference in the movement of coal to certain users whose needs were most intimately associated with general public service. In conflict with this order effort was made by Edward P. Avent, Jr., of the Bewley-Darst Coal Co., to have coal intended for cement manufacture move under claim that it was intended for manufacture of gas, which would have entitled it to priority.

The Supreme Court of the United States ruled on this case on Nov. 17, stating very emphatically that Congress exercised its reasonable powers in the protection of the public, and the Interstate Commerce Commission properly carried out an executive function in establishing priority regulations. Thus the defense made on behalf of Mr. Avent, claiming that the provisions of the order were unconstitutional, is overruled.

Two important principles were at stake, and both of

these seem definitely decided. In the first place, the government has the right to establish priorities in the securing of coal or other essential commodity in time of shortage. In the second place, the attempt to secure such essential commodity in violation of these orders, if proved, would constitute fraud and be subject to proper court action and penalty. Thus the necessity is again emphasized that industry must safeguard itself against coal shortage by the maintenance of adequate coal stocks laid up during the period of slack demand and ample railway facilities. And it becomes clearly incumbent upon industrial fuel users to recognize and observe future priority regulations laid down in the interest of public service.

An Unconquered Economic Waste

THERE seems to be something peculiarly fascinating about the idea of recovering tin from old cans. The argument runs something like this: All of the tin consumed in the United States, 75,000 tons in 1923, is imported either as metal or concentrate; a substantial amount, estimated at 35,000 tons in 1923, goes into the manufacture of tin containers that are thrown away after use. These are the facts that establish the enormity of the economic crime.

That there is an economic waste is unquestioned, but the above premises neglect other factors of equal or even greater importance. The real status of the detinning industry is disclosed in reports of the U. S. Geological Survey. In contrast with the 35,000 tons of tin used in making tin plate in 1923, the total recovery of tin as metal or as compounds from tin plate scrap and cans was 2,917 tons, and of this quantity only about 3 tons was obtained from old cans. And this in spite of the fact that the detinning plants of the country are equipped to handle old tin cans at the rate of 25,000 tons a year!

Cost of collecting cans is the chief stumbling block. To be acceptable, they must be empty, unrusted, with or without labels but otherwise free from foreign materials such as water, ashes, paint and varnish; and yet the best rate that the detinning company can offer will not bring the shipper more than \$3 or \$4 per long ton after loading and freight charges are paid. Unless municipalities compel the segregation of clean, dry cans in garbage collection or some genius devises an economical method of recovery from mixed garbage, detinning of old cans seems doomed as an economic failure. Like the gold in the Palisades of the Hudson, a valuable material is there, but profitable extraction is not possible under present conditions.

Putting a Wet Blanket On Technical Progress

SECRETARY of Agriculture Gore in opening the National Conference on Utilization of Forest Products summarized the forest industries' difficulties in making new developments in such a way that one might think that he was talking of any one of a dozen industries. Certainly the following comment would be applicable to several other branches of American business:

"It might be asked why, if better methods are feasible, they are not automatically adopted as a matter of competitive improvement of business practice. We of the Department of Agriculture have been asked that question hundreds of times in a hundred fields of agricultural activity. We have learned the answer through long years of experience, and the answer always includes one or more of the following reasons:

Inertia of trade practice, and persistence of established customs.
Necessity for new training for operatives.
Necessity for new investments in plant or equipment.
Necessity for closer executive supervision.
Necessity for standardizing specifications.
Necessity for reorganizing and educating markets.

"The department has again and again encountered or devised improved methods capable of paying dividends on all the costs involved but still failing of widespread adoption for many years, simply for lack of an organized effort to overcome such obstacles."

With a few exceptions such as the petroleum industry, where kaleidoscopic changes are the order of the day, technologic progress has been retarded by just such influences as the Secretary has enumerated. The older and more standardized the industry the less interested it is in improvements. Inertia continues to be the most serious obstacle in the path of industrial technology.

A Fish Diet for The Boll Weevil

IT'S an old saying that there's no accounting for tastes. As a case in point we have the Mexican boll weevil that persists in picking on the cotton plant to satisfy his avid appetite. Just why, nobody apparently ever attempted to find out until recently our good old friend Dr. Power discovered some interesting facts about Mr. Weevil's likes and dislikes.

In his laboratory at the Bureau of Chemistry, Dr. Power analyzed the cotton plant, root, leaves, fiber and seed, carefully extracting and identifying a great many substances. One of these was trimethylamine, a non-poisonous material that has long had an infamous reputation for its strong fish-like odor. Strange to say, it is to this malodorous compound that the cotton plant owes its attractiveness for the boll weevil. The next step was to provide a cheap and abundant source of trimethylamine and a search through the literature unearthed a statement made originally by Wertheim in 1851 to the effect that the compound "occurs in large quantities in herring brine, which owes to it its peculiar smell." Here, at last, was a use for herring brine, a humanitarian utilization of another of Nature's powerful forces!

Having extracted a considerable quantity of the odoriferous principle of herring brine, it was sent to Tallulah, La., to the Delta Experiment Station of the Bureau of Entomology. There Dr. Coad is reported to have obtained some most gratifying results. By placing trimethylamine upon other foliage he found the weevil would actually leave the cotton plant, thus suggesting an easy means for its ultimate destruction.

Just what will be the industrial significance of Dr. Power's interesting discovery remains to be seen. It might increase the sale of gas masks or even raise the price of sardines. It can't have much effect on the calcium arsenate manufacturer, for he is already suffering from such maladies as overproduction, large stocks and a saturated market. But in any event it gives us a new light on Mr. Boll Weevil's idiosyncracies and helps somewhat to account for his strange behavior.

From 50 Lb. Per Hour to 15 Tons Per Day

A Typical Problem in Chemical Engineering Development

Genuine Engineering Difficulties Solved in Developing a Commercial Process That Greatly Improved the Quality and Cutput of Sublimed White Lead

By J. H. Calbeck
Director of Research, Eagle-Picher Lead Co., Joplin, Mo.

THE manufacture of white lead is one of the oldest chemical industries, but notwithstanding the long experience that engineers have had in the art and the increasing production from year to year, there have been few and relatively unimportant improvements made in the processes employed. The original basic carbonate white lead corroded by the old Dutch process still remains the leader from the viewpoint of tonnage. To be sure, the patent files are full of improved processes for making white-lead pigments, but the only ones to possess a commercial history of any consequence are the Carter, the electrolytic and the sublimed white-lead process. The two former produced a basic carbonate white lead of a chemical composition quite like the white lead corroded by the old Dutch process, while the latter produces a basic sulphate white lead. The sublimed white-lead process was developed by E. O. Bartlett about 1876 at Joplin, Mo., and consists briefly of producing a white fume by burning galena and other lead products with coke and flux in a very short stack furnace called a "Slag Eye" and cooling and collecting the white fume in bags. (See "The Manufacture and Properties of Sublimed White Lead," by John A. Schaeffer, *J. Ind. Chem.*, 1913, vol. 5, No. 2.)

Although there have been such minor improvements in this process as are made in any process as it is continued over a long period of years, the engineering features of sublimed white lead have seen little change in 30 years. The product, however, has had a remarkable commercial development. This development has come after years of observation and has shown basic sulphate white lead to be equal or superior to basic carbonate white lead for many purposes. Its principal use is in ready mixed paints, and the remarkable prosperity and growth of the paint industry have made an increasing demand upon the producers of basic sulphate white lead. New plants have been built from time to time, but the question of whether to meet this increased demand by building additional sublimed white lead units as they had been built for 30 years or to try to develop an improved process for making the product was finally settled by the following circumstances:

Although more than half the lead-bearing material used in the manufacture of sublimed white lead is galena, the additional lead byproducts used are imperative to good production and good quality. There developed a critical shortage of these necessary materials, and it appeared that in order to increase production by the old process it would be necessary to use other lead byproducts.

Since the war all pigment manufacturers have been improving the quality of their products, and the effect of this competition has been very noticeable in the past 5 years in the improved quality of all white pigments. A demand developed for an extremely bright pigment, and it seemed advisable to investigate the possibilities of improving the color of sublimed white lead. The problem then was simply to make an improved sublimed white lead by a process differing enough from the original so that a different source of lead-bearing materials might be used.

It has long been known that lead fumes of almost any kind become sulphated to a basic sulphate of lead in the presence of sulphur dioxide. This principle has been used as a basis for a patent taken out by B. S. White, of Joplin, Mo., in 1916, whereby he proposed to manufacture basic sulphate white lead by converting litharge into a fume or vapor and mixing the fume with sulphur dioxide gas. So the problem seemed simple enough. All there was to do was to pass sulphur dioxide into litharge fumes or vapor and presto! sublimed white lead would result. Theoretically this is all that was done. Practically there were some genuine engineering problems encountered in bringing the process under absolute control in order to make the basic sulphate white lead of commercial quality. A discussion of these problems forms the subject matter of this paper.

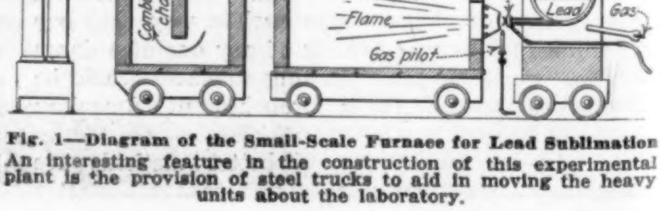


Fig. 1—Diagram of the Small-Scale Furnace for Lead Sublimation
An interesting feature in the construction of this experimental plant is the provision of steel trucks to aid in moving the heavy units about the laboratory.

Paper delivered at Pittsburgh meeting, American Institute of Chemical Engineers, December, 1924.

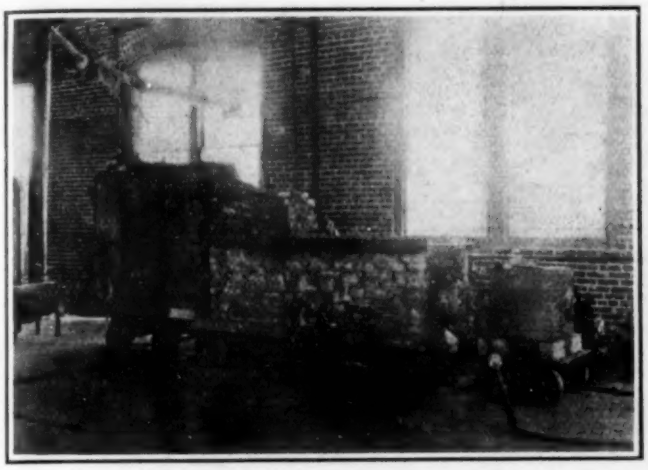


Fig. 2—The Experimental Furnace
Comparing this with the cross-section shown in Fig. 1 and the full-sized commercial unit in Fig. 8 shows how closely the original plan was followed in the final installation.

The preliminary work was done with a small experimental unit having a capacity of about 50 lb. per hour. Fig. 1 shows a diagram of the original installation. There are four important parts, the melting kettle, furnace, combustion chamber, sulphur burner and cooling and collecting systems. Since the principle of the process is the same in the small unit as in the large unit, it will be discussed in connection with the small unit.

Refined corroders' pig lead is melted in the kettle on the right and the molten lead is atomized by compressed air at 40 lb. pressure and projected into the furnace proper. Compressed natural gas at 15 lb. per sq.in. is blown in with the compressed air and the air, gas and finely divided lead burn in a white-hot torch-like flame. Sulphur dioxide gas is then introduced at the point marked "Gas Pilot," and the sulphur dioxide, natural gas, air and lead react to form the basic sulphate of lead. By changing the ratio of SO_2 to lead the chemical composition of the fume may be changed within wide limits. The fume of preferred composition consists of 25 per cent PbO and 75 per cent $PbSO_4$ in chemical combination having a formula of $PbO.2PbSO_4$.

Accurate control of the flame is necessary. If the flame is too rich in natural gas, some carbon will be liberated and discolor the product. The combustion chamber gives the reaction time for completion and burns out the small amount of carbon that even a correct burner adjustment does not eliminate. The fume passes from the combustion chamber into a series of goosenecks for cooling and is then picked up by a fan and blown into the filter bags. The bypass stack is very essential, as it may be opened quickly when the burner goes out of adjustment, thus preventing an off-color product from going into the bags and spoiling what good material may be there. The sulphur burner, not shown in the figure, was simply a steel cylinder with a blast fan at one end and an outlet pipe at the other. Molten sulphur was fed into the cylinder through a trap made of gas pipe. The collecting system consisted of the goosenecks shown in the diagram, a fan, cyclone and small bag room. Fig. 2 is a photograph of the small experimental unit. The small experimental unit worked well from the start and we had little difficulty in making a pigment equal in appearance to our sublimed white lead.

One day we opened the cyclone for a cleanout, and imagine our surprise and delight when a veritable snow-

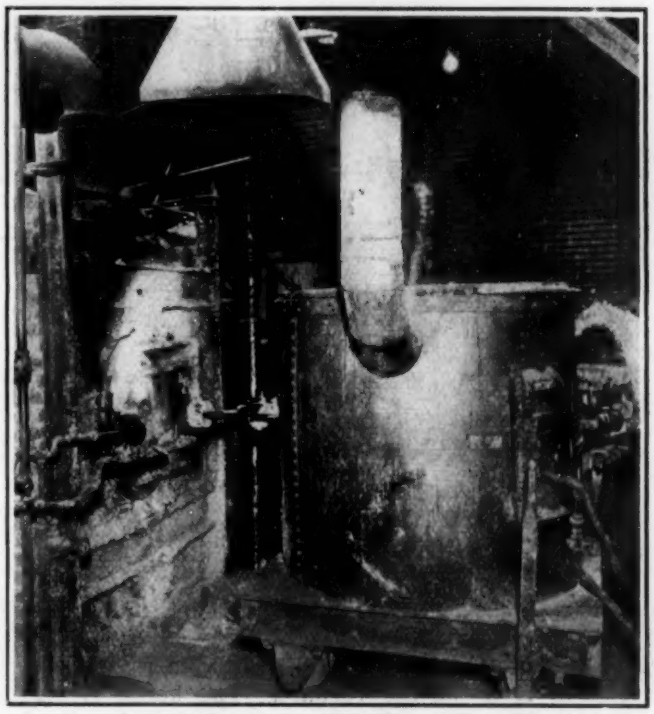


Fig. 4—Melting Kettle Withdrawn From the Furnace
The lead valve and the atomizer-burner may be seen bolted to the spout of the kettle. The sulphur fumes enter through the 8-in. cast-iron supply pipe directly above the furnace.

Fig. 3—One of the Melting Kettles in Position for Operation
The second of the three furnaces is to be seen at the right. These kettles are coal fired, since this fuel has been found preferable to natural gas for this particular operation. It will also be noted that the kettle is mounted on a truck, which permits its easy withdrawal for adjusting the burner or replacing parts.

drift rolled out on the floor. Samples were taken to the laboratory and matched against our regular sublimed white lead and it was so much whiter as to make comparison ridiculous. Comparisons with French process zinc oxide and lithopone showed it superior to both in whiteness and brightness. The little plant was started up again and run until we had manufactured several hundred pounds of the new product, which we christened "supersublimed white lead." This material was tested for color, covering power, fineness and opacity. Several hundred pounds of it was ground in oil and paints were made from it and tested, all with the result that we were instructed to proceed as rapidly as possible with a large commercial unit.

The commercial unit that was installed consists of three large furnaces, all connected to one long combustion chamber. The unit has a capacity of 15 tons per

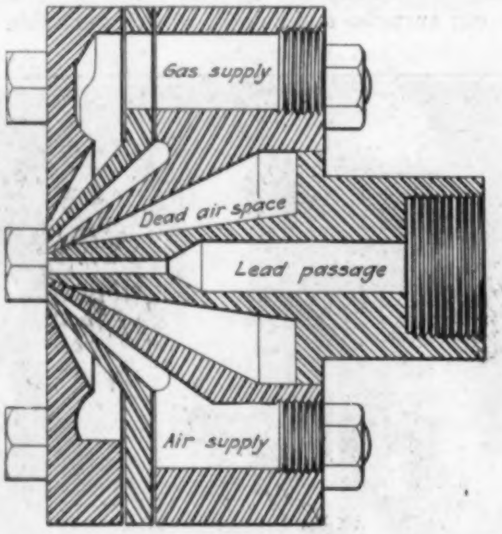


Fig. 5—A Cross-Section of the Atomizer-Burner
The dead air space surrounding the lead passage proved to be the most effective means for preventing the freezing of the small stream of molten lead.

day. Fig. 3 shows the complete installation in operation.

Fig. 4 shows the kettle withdrawn from its position directly in front of the furnace. The kettle is coal fired, for although we have an abundance of natural gas, we find that a more uniform temperature may be maintained with coal than with gas, and correct temperatures are very essential for atomizing lead. The kettle, which has a capacity of about 3 tons is mounted on a small truck that runs on a track about 12 ft. long directly in front of the furnace and in line with it. This arrangement is essential inasmuch as the kettle and atomizer-burner must be withdrawn from their position in front of the furnace for adjusting or replacing parts. The kettle is easily moved forward and backward by the lever and ratchet attached to the rear axle. Bolted onto the spout of the kettle may be seen the lead valve and the atomizer-burner. Fig. 5 is a cross-section of the atomizer-burner. The central member of the atomizer-burner is the lead nozzle. Surrounding it and separating it from the compressed air chamber is the dead air space. We were troubled for more than a year by the atomizers freezing up. Although the atomizing air was preheated, the expansion cooled the tip of the atomizer so rapidly as to freeze up the small stream of lead. After the development of the dead air space, the lead was insulated from the

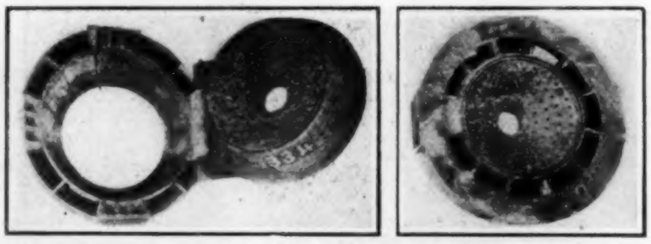


Fig. 6—Two Views of the Pilot Burner of the Sublimation Furnace
At left the burner is open for cleaning, at right is its appearance if viewed from the inside of the furnace. The atomizer-burner fills the large center opening, the gas flames issue from the small openings, four of the rectangular openings in the periphery are for air and four are for the sulphur dioxide.

colder air and the freezing became very infrequent. The compressed air strikes the lead stream from all sides and reduces it to a fine spray that is easily volatilized and oxidized by the high temperature of the flame into which it is projected. Outside of the air supply and concentric to it is the gas supply. In the early stage of this process we attempted to use gas at low pressure, but the flame was blown so far back into the furnace as to be very inefficient. Forcing the gas into the air stream at 15 lb. pressure gives a better mixture, with the result that the flame burns back within a few inches of the tip of the atomizer.

In Fig. 4 a large casting may be seen set into the brick work of the front of the furnace directly in front of the atomizer. This casting is the pilot burner and sulphur dioxide port. The sulphur dioxide gas is delivered to this casting by means of the 8-in. cast-iron supply pipe. The simple gate valve for control of the sulphur dioxide may be seen to the left of the elbow. Figs. 6 and 7 show the pilot burner. The atomizer-burner just fills the large hole in the center. Gas flames

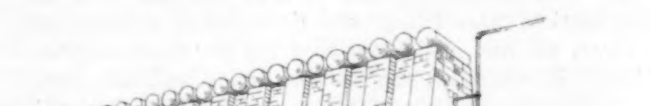
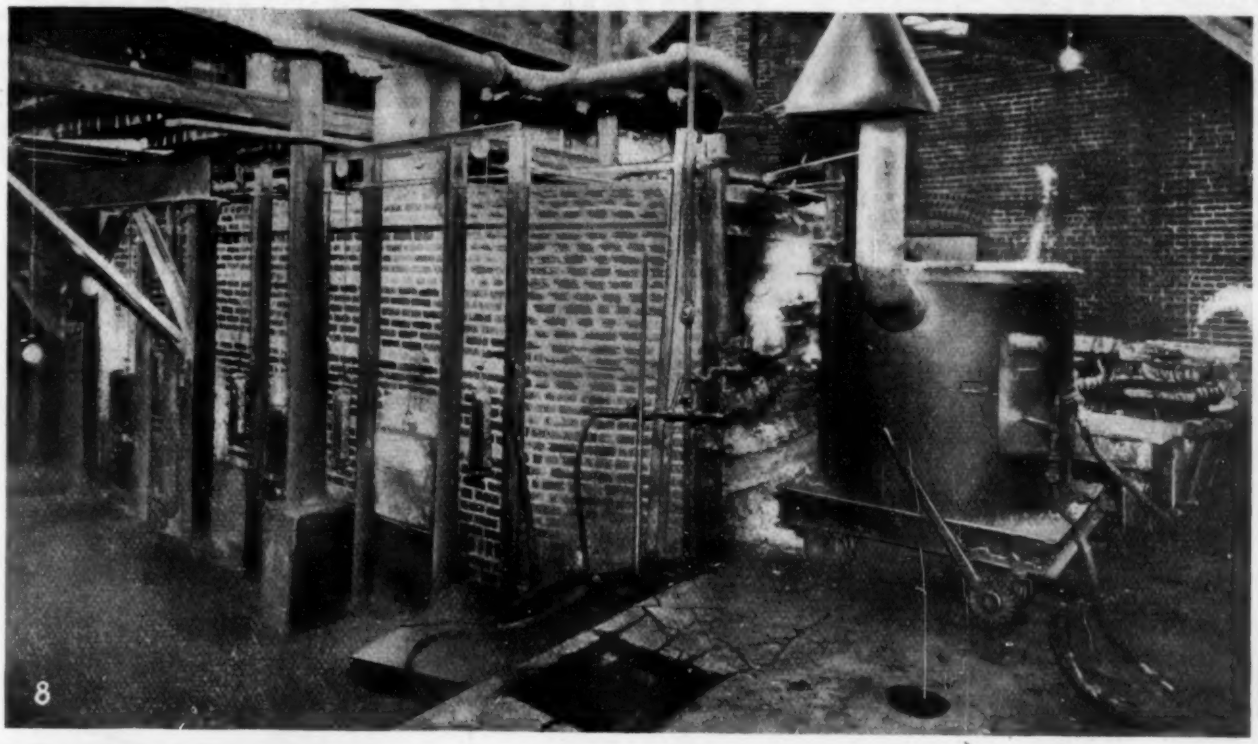


Fig. 7—Sketch Showing Furnace Construction
The four clean-out doors on the side of the furnace proper are clearly seen in this drawing. So, too, is the large outlet at the top that opens into the combustion chamber overhead



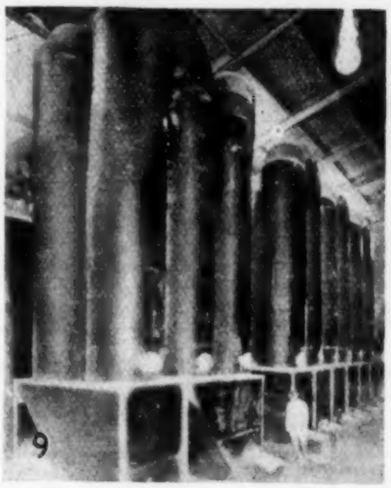


Fig. 8—The First Commercial Unit for Supersublimed White Lead

The melting kettle, holding 3 tons of molten lead, is mounted on a truck in order that is may be easily withdrawn for adjustment.

Fig. 9—The "Gooseneck" Cooling System for the Sublimed Lead Pigment

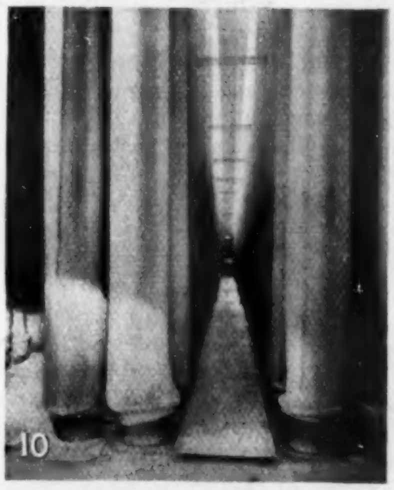
From the cyclone separator that removes heavy scale and other impurities, the lead fumes pass through these coolers to the fans and bag filters.

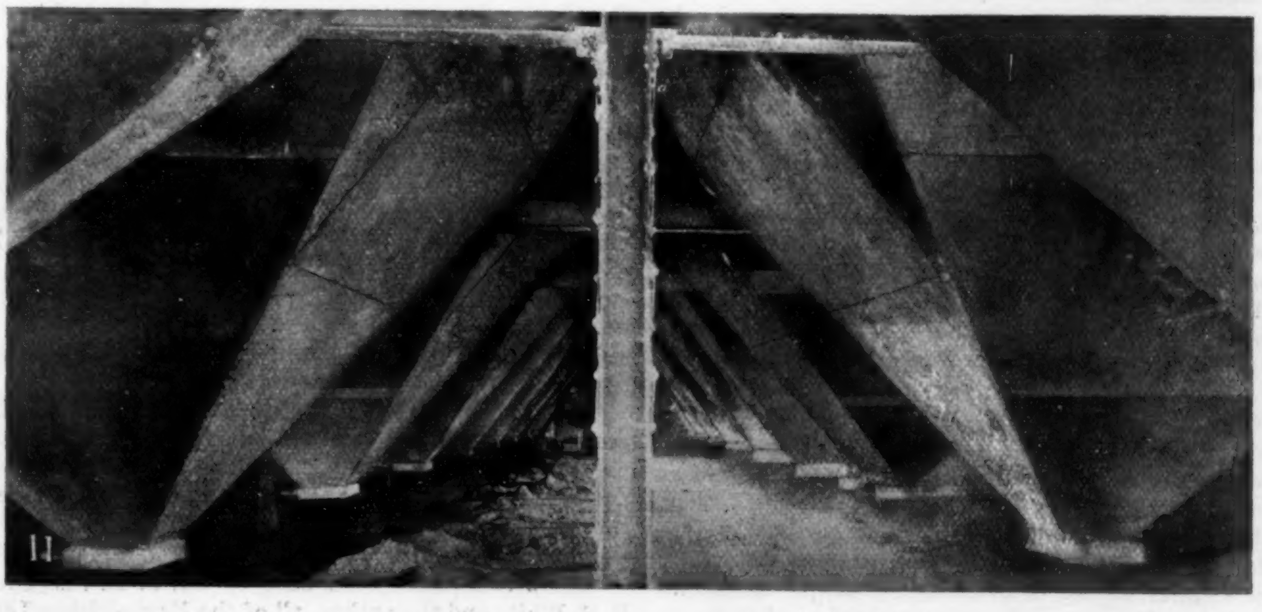
Fig. 10—An Aisle Through the Filter Bags in the Bag Room

The sublimed pigment is here separated from the lead fume.

Fig. 11—Hoppers Beneath the Filter Bags

It is here the finished product, "supersublimed white lead," is finally removed from the manufacturing process.





issue from all small holes in the central member. All but four of the large rectangular openings in the outside member admit air. These four which are opposite the projections in the casting admit the sulphur dioxide gas.

Operating the Commercial Unit

Pig lead having been melted and brought to the proper temperature in the kettle, the lead is turned on by the lead valve and its flow properly adjusted before the air is turned on. The lead runs out in a small stream about ⅛ in. in diameter and is allowed to fall on the floor until the proper adjustments have been made. Then the kettle is wheeled forward by means of the lever and ratchet. The atomizer-burner passes through the hole in the center of the pilot burner. This brings the kettle to the position shown in Fig. 8. The air and gas are turned into the atomizer-burner and formation of supersublimed white lead is instantaneous. The operator, or "front man," adjusts the gas in both the pilot burner and atomizer-burner, and the air in the atomizer-burner until the flame produced is of the proper color and length. One front man watches the three furnaces. He has two helpers to keep the kettles supplied with lead and properly fired. Occasionally a burner goes out of adjustment and the kettle is wheeled back and the atomizer-burner trimmed and readjusted. The atomizer-burners have to be removed once or twice a day and thoroughly cleaned and reassembled. Both the gas and the air are preheated before passing into the atomizer-burner. Coils of pipe are set in the walls of the fireboxes under the kettles and used as preheaters.

The furnace proper has a large rectangular basin 22x8 ft. and is 8 ft. high. There are four clean-out doors on each side (see Fig. 7) and an outlet hole in the arch at the back that opens into the combustion chamber overhead. The important feature of the furnace is the lead basin that forms the floor of the furnace. This basin is of boiler-plate steel, lined with brick, and contains a bath of lead about 10 in. deep. The heat of the furnace keeps the bath molten, and the oversize uncombined material from the atomizer falls and floats on the surface of the molten bath and is easily raked off through the clean-out doors once a day. The amount of this clean-out depends upon the care and skill with which the atomizer-burner is adjusted. In a year's time we have developed some very expert operators, who manage to keep this clean-out down to a reasonable figure, although for a long time the amount of this clean-out was one of our chief difficulties.

From the furnace proper the fume passes into the long brick trail overhead which acts as a combustion chamber. Pyrometric control is maintained on each furnace and on the fume as it leaves the combustion chamber. The draft in the furnace, which is provided by the suction fan that carries away the fume, must be carefully adjusted, and recording draft gages are used in this control. The fume from the combustion trail passes directly into a large cyclone. The cyclone separates out a small amount of heavy material such as scale from the sides of the combustion chamber and furnace and any uncombined lead that may carry over during periods of poor adjustment. From the cyclone the fume passes through the cooling goosenecks into the fan and then into the bag room.

The sulphur burner is an extremely simple affair and no doubt would seem crude to one experienced in burning brimstone for acid manufacture, yet it fits our need exactly. It consists of a rectangular furnace 16x4x4 ft. built under ground and covered with earth. The sulphur is fed through a deep kettle, which is mounted in the arch of the furnace. A hole in the bottom of the kettle and a conical cast-iron plug serve the function of a valve. The heat from the furnace keeps the sulphur in the kettle molten, and by adjusting the plug in the hole by means of a lever on top of the kettle a uniform supply of sulphur is afforded. Air is supplied from a blast fan into one end of the furnace. The sulphur fume passes out the other end through a water-jacketed section of cast-iron pipe. Only sufficient air is admitted to keep the sulphur fume in the vapor phase.

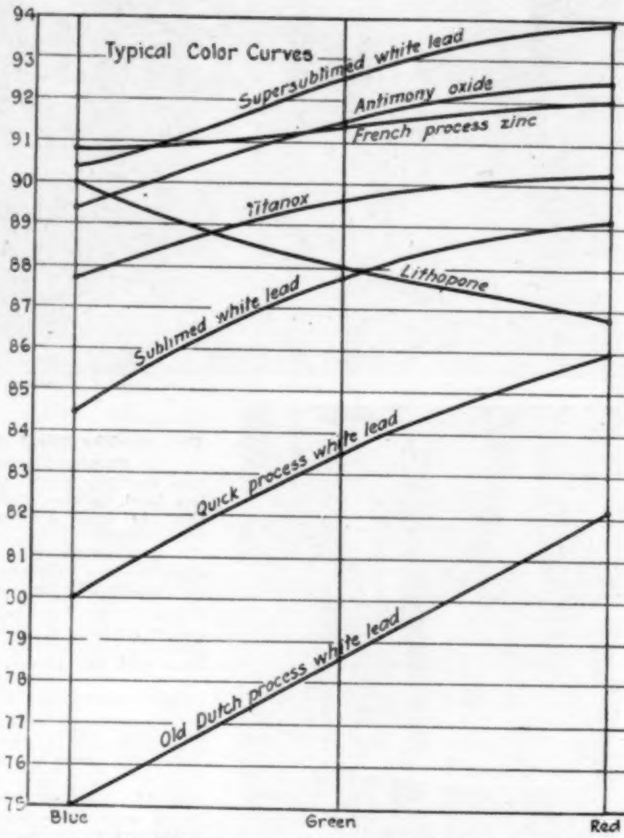


Fig. 12—The Brightness and Whiteness of the New Pigment Compared With Other Typical Products

Complete oxidation of the sulphur is not desirable, because it seems that the more sulphur vapor fed into the burner without it condensing and running down into the burners the better results are obtained.

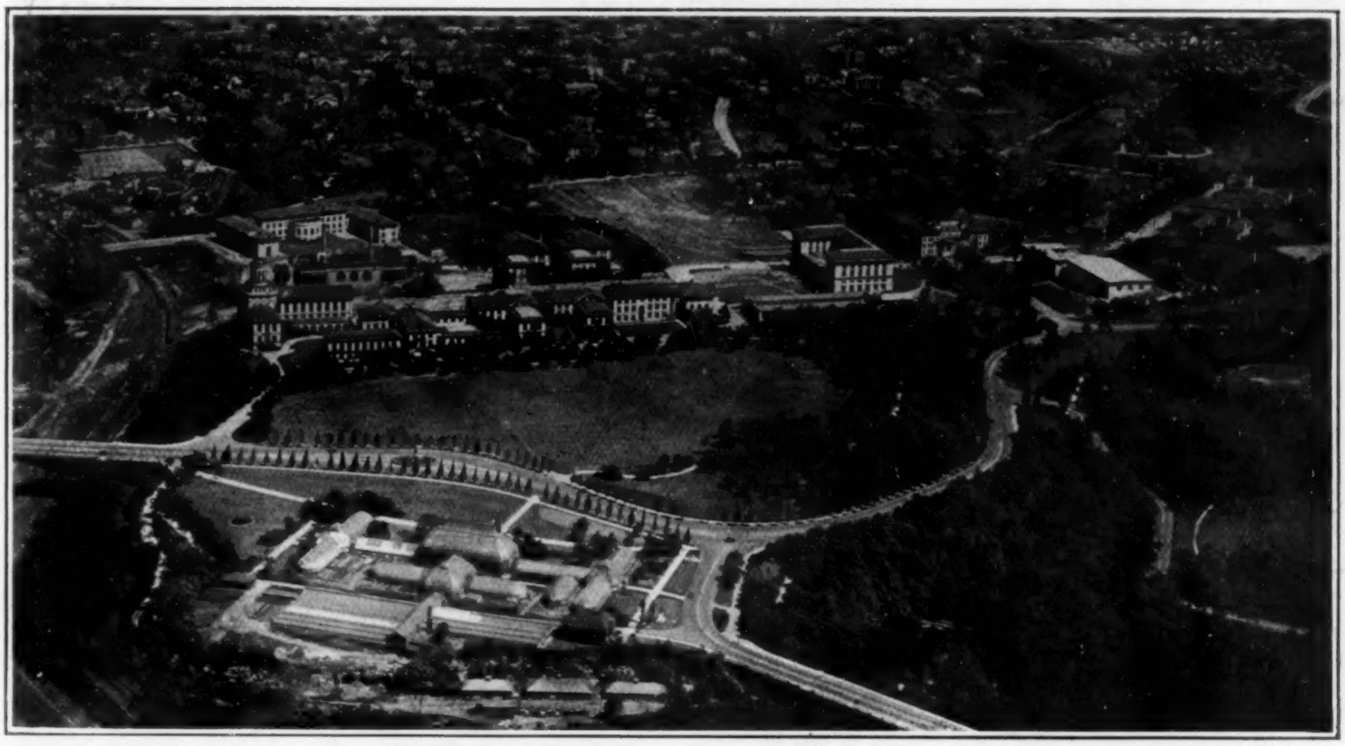
Fig. 12 shows a comparison of the whiteness and brightness of typical pigments. The more horizontal the color line the whiter is the pigment and the higher on the chart the brighter the pigment. Supersublimed white lead is at the top of the chart. Furthermore, its behavior in oil and its covering power are equal to or superior to any other lead pigment and its durability promises to equal the other white leads, since it is so similar to sublimed white lead that has stood the test of time.

The first experimental work on this pigment was begun 2 years ago in October and the large unit began operation a year later. The plant has now been in successful operation for more than a year with less than 60 days shut-down for repairs or awaiting orders for the product. The design, construction and operation of this process have been done by Dr. J. A. Schaeffer, B. S. White and the author, all of the Eagle-Picher Lead Co. of Joplin, Mo.

Pittsburgh's Industrial Vigor Amazes Chemical Engineers

Seventeenth Annual Meeting of the American Institute of Chemical Engineers Features Activity of Great Industrial Center

Editorial Staff Report



Airplane View of the Carnegie Institute of Technology

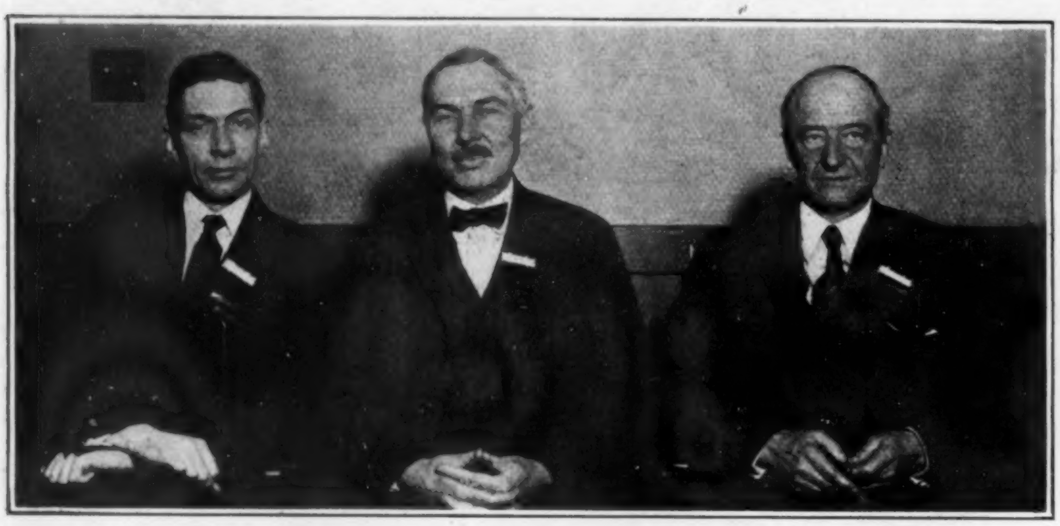
BACK in the Paleolithic era when Pittsburgh was a smoky city the American Institute of Chemical Engineers held one of its first meetings there. It was therefore quite appropriate that in this year, 13 A.M.I. (anno Mellon Institute), the members of the American Institute of Chemical Engineers should return and see the metamorphosis into the "smokeless" city. Whatever opinion they may have formed as to its smokelessness, the hundred or more visitors were given a vivid picture of Pittsburgh as a center of chemical engineering progress. The papers dealing with the activities of the district in research, in industry, in engineering; the trips to the laboratories and industrial plants; the contact with men in those industries have all contributed to an impression of industrial greatness and power that it would be difficult to duplicate anywhere in the world.

The meeting itself was a good one. There were a number of good papers and some of them were considerably better than they seemed at the meeting. This was due to two main troubles that seem to be chronic. First, there were too many papers, and therefore it was necessary to hurry and crowd the speakers. Frequently a man had only a few minutes in which to present an abstract with no time for discussion. This should be enough for presentation, though it neglects the more valuable discussion, but many are not prepared to do anything but read their papers, and the result is confusion. In this respect the Pittsburgh meeting was like the others. Some men read their papers and put the audience to sleep. Some had to hurry so much that their presentation was confused. But with all these objections the result was excellent.

"The only way to larn Latin is to larn it." So, profiting by the advice of the eminent Scot, the Institute went to see Pittsburgh's industries

The trips were unusually good. The first one, through the Mellon Institute, the Bureau of Mines or Carnegie Tech., was repaying. Many of the visitors had never been through the Mellon Institute, and the experience of passing from room to room and discovering in each one a new industrial problem handled by an experienced research man is an inspiration. Of course some of the rooms are pleasantly evasive, but that is to be expected. Other fellowships are ready to tell the whole story and it is usually a good one. The trips on the next afternoon offered a bewildering choice. The Westinghouse company, with its immense establishment; the new plant of the American Window Glass Co., with the latest equipment for drawing glass from pots in the form of huge cylinders and then cutting them up into pieces; a modern plant of the Carnegie Steel Co., Harbison-Walker refractories, Heinz and the famous 57, and a modern storage battery assembly plant. The

following day there was an all-day excursion to the Donora plant of the American Steel & Wire Co., with an afternoon stop at the Clairton plant of the Carnegie Steel Co., where they make coke on what might be called a commercial scale. At Donora there was first the sulphuric acid plant, where SO_2 is obtained from zinc sulphide ore and the roasted ore is then reduced to metallic zinc. This then goes along to the galvanizing plant, where it meets iron and steel from the mills at the other end of the valley and is made into nails, fence and innumerable other articles that combine the two metals. The afternoon stop at Clairton was just as interesting, for any plant that processes 21,000 tons of material per day, even if it was only shoveled from one pile to another, would be worth seeing. At Clairton they do more than shovel it. Coal is floated down the river from the mine in great iron barges and grabbed out of them in huge 5-ton bites. Then it must be milled and transported to the batteries of ovens. One of these batteries is the new Becker type of oven recently erected by the Koppers Co. Sulphate of ammonia, light oils and gas are the three main byproducts. The light oils give benzol, toluol and naphthalene and it is interesting that the quality of benzol now being produced in the byproduct plants of some of the steel companies is equal in quality to the very best chemically pure benzol before the war. Gas from these ovens is piped to Homestead and other big centers of consumption in 54-in. mains. Aside from the size of the plant, the most interesting thing was the method of operation and the schedule of production. Last year, with a program of pushing a coke oven every 2½ minutes, they pushed exactly that number of ovens, no more and no less. Nor is there anywhere in the plant operating leeway. Everything must go on schedule. There is not a pound of coal except what is in process. This created some comment among the engineers, but the reason for it is apparent. A storage pile for one day's operation would be large and the double handling would be expensive, so that although the system appears too inflexible for big-scale work, it seems to be successful, and that after all is the ultimate test.



Three Familiar Faces at the Institute Meetings

Left to right—R. D. Landrum, president American Ceramic Society; A. H. White, professor of chemical engineering, University of Michigan, and F. G Stantial, vice-president Merrimac Chemical Co.

A Few of the Directors of the Institute

Seated left to right—President Charles L. Reese and Secretary J. C. Olsen; standing left to right, E. R. Weidlein, director Mellon Institute; Edward Bartow, professor chemical engineering Iowa State University, and Hugh K. Moore, technical director of the Brown Co., Berlin, N. H.

A picture of the part Pittsburgh plays in the industrial scheme of things told in several unusual papers

A paper by E. R. Weidlein, director of the Mellon Institute and chairman of the local committee for the Pittsburgh meeting, introduced the members to the chemical engineering activities of the Pittsburgh district. He pointed out the little realized fact that the industries of the district are unusually diverse. It is customary to regard it as an iron and steel center and to neglect some of the other remarkable developments. Not unnaturally, on account of the demand for metallurgical coke, the byproduct coke industry has grown to gigantic proportions in that vicinity, and includes the Clairton plant of the Carnegie Steel Co., the largest coke-oven plant in the world. The glass industry is well represented in the plate, window and laboratory field. Pittsburgh is also a center of the refractories field, with the offices of the association at the Mellon Institute and several large plants near at hand. More radium has been produced in Pittsburgh than in all the rest of the world put together, and although there will be a cessation of this activity until the ore recently found in the Belgian Congo has been exhausted, it will doubtless regain its leadership some time in the future. The tremendous plant of the Westinghouse Co.

with the great variety of electrical equipment as products, Heinz' 57 varieties, zinc and petroleum refining and heavy chemicals are a few of the other industries that have made the district famous.

Mr. Weidlein then turned to research activities as exemplified by the consulting laboratories, the large experiment station of the Bureau of Mines, Carnegie Institute of Technology and the University of Pittsburgh, and finally the Mellon Institute. This organization is probably the best known research laboratory in the country, at least among industrialists. At the present time it is carrying out work in fifty-five different research fields with sixty separate units and 100 fellows. The total income this year will probably pass the $500,000 mark. Mr. Weidlein concluded with a few words about some of the problems that are being carried out.

Dr. A. C. Fieldner explained the work of the Pittsburgh Station of the Bureau of Mines. It is divided into several sections such as fuel investigation, accident prevention in coal mines, explosives in coal mining, use of electricity in mines, ferrous metallurgy and the chemical and physical laboratories that go with and complement these investigations. Much of the work is done in the field and the bureau has an experimental coal mine and an explosion trench, as well as other small buildings not far from Pittsburgh.

Pittsburgh and Power Consumption

W. F. Rittman, professor of industrial engineering at the Carnegie Institute of Technology, presented an able discussion of Pittsburgh as a power center. His work as consulting engineer for the State of Pennsylvania has given him a close contact with the superpower problem and his talk reflected the superpower point of view. In the Pittsburgh district there is more than 6 hp. per workman, as against a little more than 4 for the remainder of the state. This in turn is higher than that for the United States by 100 per cent. Pittsburgh has 2 million of the 6 million installed horsepower of the state and more than half of the used horsepower, while 60 per cent of Pittsburgh's quota is utilized in the iron and steel industry.

Still another angle of the problem is interesting. There is two and a half times as much as there was 10 years ago and we have almost reached that goal of the electrical engineer of 1 lb. of coal per kilowatt-hour. Perhaps the most striking development in the last few years is the remarkable increase in purchased power. Nearly 25 per cent of the total is purchased and the tendency is decidedly in this direction. The plans now under contemplation call for the construction of huge 600,000-kw. plants with a coal consumption of more than 300 tons per hour. They will be located at the mine mouth to avoid long shipment of coal, and the coal will be coked in byproduct ovens before using it in the boiler. The current thus produced will be transported over 250,000-volt lines and for distances up to 300 miles, for it has been shown in practice that less than 10 per cent loss will occur on the lines under those conditions. Dr. Rittman expressed the opinion that this system would have a fundamental influence on industry, for it thus becomes possible to ship power to the worker instead of shipping the worker to power. This will make unnecessary the tremendous industrial congestion that exists in so many places today.

Another Pittsburgh paper, presented by H. B. Meller, chief of the Bureau of Smoke Regulation, told of the herculean task of ridding Pittsburgh of its smoke nuisance. A series of analyses of the solids in air in many cities shows interesting things. First, Pittsburgh has a very high percentage of solids but a very low tar content of the solids. This low tar content is due to the work of the Bureau of Smoke Regulation. It has been able over a period of time to burn out the tar and produce in general much better conditions as regards visible smoke. The quantity of solids is higher than it was formerly, however.

Chemical engineering active in electrical field, in varnish production, in furnace design and control and in other fields

One of the most interesting papers was that by David R. Kellogg, of the Westinghouse Co. His subject was chemical engineering developments in the electrical field. He made a plea for the better mutual understanding and appreciation on the part of the electrical engineers and chemists. Much is to be gained by their closer association. Among those things that the chemical engineers have done in the electrical field is the improvement of incandescent lamps. From the old carbon filament lamp that consumed 5 watts per candlepower they have gone successively through the brittle tungsten light to the present gas-filled lamp, which consumes less than 1 watt per candlepower. The lead wires to the filament also presented a nice problem, the early ones being made of iron. Then came platinum and finally an alloy called Dumet, consisting of Mo steel inside of a brass tube with copper on the outside next the glass. The problem was to find a metal or a combination of metals that had the same coefficient of expansion as glass and would be wet by the glass when the bulb was made. And so it goes through many different fields; the electrical engineer builds machines that need materials having special properties and it is up to the chemical engineer to supply those materials. Sometimes a remarkable improvement enables the electrical engineer to build a new and better machine, more efficient in operation, cheaper in construction. Sometimes a standard piece of equipment has some drawback that must be eliminated. A good example of this is the oxidation and sludging of the oil in transformers. This has largely been overcome by eliminating the oxygen from the gas space above the oil. There are other problems, such as electrical conductors, which must be made all the way from very low to high resistance, lubrication, magnets, protective coatings.

Some Varnish Troubles Defined

Chemical problems of insulating varnishes might seem to the uninitiated like a somewhat simple subject. H. C. P. Weber took care of the initiation of those present so that no one present believes that varnish is an easy problem. Three classes may be differentiated: the superficial coating, the impregnating varnish and the cementing and bonding varnish. Obviously the coating varnish must be moisture proof or as nearly so as possible. Under various conditions it may have to be acid proof, show high dielectric strength and resist temperature rise. Penetration becomes a significant factor in the second type of varnish, the impregnating varnish. This depends on viscosity, colloidal condition and upon certain individual characteristics.

The action that takes place upon the application of varnishes is the evaporation of the solvent in the case of the spirit varnishes or shellacs, air drying or oxidation of the varnish film to form linoxyn. It is unfortunate that the oxidation cannot be stopped at this point while the film has elasticity, but it does continue until the varnish chips off or flakes. Dr. Weber emphasized the problem that arises from the acidity that develops in the varnish after it is applied. For example, in a 7-ft. armature coil a quarter of a pound of acid (expressed as an acetic) could be present on a basis of experiments carried out by Dr. Weber, and with a hundred such coils the quantity of acid would be very considerable (25 lb.). It can readily be imagined what effect this corrosive high conductivity material would have in such a generator. Dr. Weber has given much attention to this subject and has shown that the oil is not alone to blame. Chinawood oil develops considerably less acid than linseed oil and raw linseed is also better than either blown or refined oil. The driers, too, have a varying effect, gilsonite being somewhat better than either calcium or zinc resinate.

Furnace Control a Vital Problem for Most Engineers

The subject of furnace atmosphere control came in for some attention through a paper by Prof. W. Trinks, of Carnegie Tech., read by a colleague. Wherever oxidizable material comes into contact with furnace gases, even if there is no oxygen present, there is likely to be a great deal of corrosion. To avoid this the cry in the plants is, "Keep her smoky, boys!" because reducing atmospheres protect metals. This of course means a loss of fuel value, because every pound of carbon monoxide that goes up the chimney means money. The metallurgist or the furnace operator has to look on it as insurance against a higher loss by corrosion. The adjustment of the furnace gases so that they maintain this condition is not difficult, although it is an extremely qualitative adjustment, but the automatic control of furnace atmosphere is considerably more of a problem. It has been attempted with gaseous fuels by proportioning the air and gas in the mixture, by means of either interconnected valves or a motor with adjustable intake. Dr. Trinks described several methods of controlling the atmosphere when gaseous fuels are used. With liquid fuels it is a more difficult problem, for the simplest system, the interconnecting oil and air valves, will work constantly only if the temperature, pressure and viscosity of oil are constant. The viscosity depends on temperature and on the composition and kind of oil used. Lack of appreciation of this has brought many so-called systems of temperature control with liquid fuels into disrepute. The eye of the heater happens to be a fairly accurate gage of the furnace atmosphere when liquid fuels are burned, and this is on the whole a fortunate circumstance. A deficiency of air gives a hazy atmosphere, which if checked from time to time in an Orsat apparatus gives a pretty accurate control of conditions. Dr. Trinks closed with a brief discussion of control of furnace atmosphere when solid fuels are used, pointing out that it is easier to regulate the atmosphere with powdered coal than when fuel is burned on a grate. Even in the latter case it is not impossible if correct design and constant attention are combined.

Two papers on boiler water treatment failed to produce a serious difference of opinion, although there was a time when it looked as though the Permutit zeolites were going to clash with a new and artificial base-exchanging silicate. But war was averted. Under the somewhat mystifying title of "Doucil [called Dusil], a New Base-Exchanging Silicate," J. G. Vail, of the American Doucil Co., described this water softener. Its action is based on the same principle as that of natural zeolites in which the sodium silicate is changed to calcium or magnesium silicate upon exposure to hard water. The sodium silicate is regenerated by treating with ordinary salt solution. Doucil approximates the formula $Na_2O.Al_2O_3.5SiO_2$, and is a gel in structure. The fine capillaries of the gel structure make a greater percentage of sodium available for exchange. In natural zeolites a cubic foot (90 lb.) will bind 2,700 grains of calcium carbonate, whereas a cubic foot of Doucil, containing 25 lb. of anhydrous silicate, will absorb 12,500 grains.

The Mellon Institute From a New Angle
This is one of the things the visitors got from their visit to Pittsburgh

The material is hard, colorless and translucent, like opalescent glass. It is not strictly a zeolite, since zeolites usually contain more than 30 per cent Al, and this contains less than 25 per cent.

There are certain waters that Doucil will not soften economically, such as those containing hydrogen sulphide or oils, both of which clog the pores of the gel. The regeneration of the gel with salt solution and the back-washing of impurities from a Doucil bed were also discussed. It is interesting that 85 per cent of the calcium and magnesium is replaced by sodium in the first half of the washing with brine. This fact permits a considerable saving in salt by dividing the regenerating solution into two parts and using the last half on a second bed of material.

The other paper on boiler water treatment was given by R. E. Hall of the Bureau of Mines, entitled "Boiler Water Treatment Based on Chemical Equilibrium." The paper was read by a colleague of Mr. Hall and discussed the various types of scale that are formed in the different parts of the boiler. It then pointed out the ways in which the scale could be taken care of, as suspended solids in the blow-off, or as unprecipitated material, or finally as filtered or settled out material in the boiler feed water.

Papers were also presented by J. H. Calbeck, of the

Eagle Picher Lead Co., on "Supersublimed White Lead"; R. H. Heilman of the Mellon Institute, on "Heat Losses of Bare and Covered Pipe"; H. G. Chickering of the du Pont Company, on their recent developed cyanide process. These appear in *Chem. & Met.* for this week or will appear in an early issue and need therefore no further comment.

Maximilian Toch gave a stimulating résumé of the remarkable advances made in lacquer varnishes so recently developed as automobile finishes and for many other purposes. These devolpments should be a source of inspiration to all chemical engineers, as they are distinctly a chemical engineering advance.

The Local Committee for the Pittsburgh Meeting
Seated, left to right: W. A. Hamor, W. F. Rittman, E. R. J. Casselman, Tracy Bartholomew, Alexander Silverman, H. C. Weidlein, J. H. James; standing, left to right: H. N. Meyers, E. Bashioum, L. C. Turnock, J. H. Young and E. E. Marbaker.

It would be inappropriate not to mention with warm commendation the so-called popular lectures that were given at the meeting. Dr. C. H. Viol of the Standard Chemical Co. told of the work his company has done on radium and radon (the recently adopted name for radium emanation). Starting with a large quantity of ore (approximately 200 tons) about one gram of radium can be obtained after an exhaustive chemical treatment and fractional crystallization and precipitation. At the present time there is likely to be a cessation of activity until the rich ore of the Belgian Congo is exhausted, for the Colorado ore can not compete with it. But as the supply of Congo ore is limited, there will ultimately be a resumption of working the Colorado ore. The refining process is much more difficult than looking for a needle in a haystack, for the needle is all in one piece, whereas the radium is spread out through the entire 200 tons. Dr. Viol introduced his talk with a description of the discovery of radium and of the method of formation of the material in minerals through geological ages by the disintegration of uranium and its immediate disintegration products. He also described in detail the utilization of radon in cancer therapy.

President Reese gave a history of the explosives industry during the last 25 years, and Dr. C. E. K. Mees of the Eastman Kodak Co. treated the audience to a popular talk on amateur cinematography. It was exceedingly interesting to compare the equipment necessary to take a few pictures 40 years ago with the compact cameras of today. Dr. Mees described the work he has been doing to develop a small, compact and inexpensive machine that would make motion pictures popular. The design of a small-size film that was still large enough to give clear definition was one of the tasks, and having decided on the optimum size, the construction of a camera presented many absorbing problems. Perhaps the greatest single forward step was achieved when it was found possible to develop a positive image on the same film that was exposed in the camera, thereby saving two expensive steps necessary in the production of commercial motion pictures. These lectures, the receptions and lunches and dinners together with a taste of—well, call it good fellowship formed the background for the more substantial gains that an Institute meeting always affords.

France Can Produce Two Million Tons of Sulphuric Acid Yearly

A study of France's position with regard to the production of chemicals appears in the *Progres de Saone et Loire* over the signature of M. Delafuye. The writer considers that French factories can now produce 2,000,000 tons of sulphuric acid yearly, a quantity which exceeds normal requirements by 500,000 tons. On the other hand, France is poor in soda, depending largely on her neighbors. The return of Alsace and Lorraine to France has insured a supply of potash in excess of French needs, so that France is in a position to export several hundred thousand tons annually. The Alsatian potash workings produced 1,026,042 tons in 1923 and 391,000 tons during the first 4 months of 1924. There is still a lack of factories for the production of potassium sulphate.

An increased production of nitrates has been assured by the installation of the Casale process at Toulouse. Last year France was obliged to import 57,500 tons of nitrates, but it is estimated that this quantity will be reduced year by year until ultimately the country is completely independent. The writer considers that the French dyestuffs industry is developing very satisfactorily; in 1923 French factories produced 10,000 tons of dyestuffs, imports being reduced from 5,800 to 1,370 tons. If exports of dyestuffs of French manufacture are taken into account, France only had to import from abroad 9 per cent of her total consumption.

What a Chimney Has to Do

Some Difficulties Encountered in the Design of Chimneys in Chemical Engineering Industries

Abstracted From a Report
By the Alphons Custodis Chimney Construction Co.

A CHIMNEY is called upon to perform many varied duties in addition to producing draft for steam boilers. This multiplicity of duties presents many chimney problems, such as the determination of proper height, size and particular design. This is especially true for chimneys in chemical plants, dye works, smelters, paint color factories, silvering industries with their pickling and plating departments, the picture film industry, sintering plants, celluloid factories and innumerable industries, all of which are confronted more or less with the handling of some form of acid gases.

Many of these gases are destructive to ordinary brick and mortar, steel, tile and concrete. Many are destructive at certain temperatures and harmless at other temperatures; destructive with certain conditions of moisture, but harmless with others.

The subject is an extremely diversified one, requiring not only a knowledge of the mathematical and mechanical features but a knowledge of chemistry, thermodynamics, ceramics and subjects dealing not alone with the flow of gases but with the effects of different kinds of acid gases under different degrees of concentration and different conditions of moisture and temperature on a chimney.

Many of these chimneys are not operated in connection with steam boilers, but are connected directly with roasting kilns, furnaces and other apparatus used in the production of chemicals, acids, reduction of ores, the manufacture of colors, photo films and celluloid products.

A chimney to handle noxious and acid gases must be designed and built not only for adequate capacity and draft but also to resist the destructive effect of the particular acid gases, dust, fumes and temperatures and in addition to resist the dynamic wind forces that tend to fell it. The smoke streams emitted from such chimneys contain acids in both liquid and gaseous form. They are often a nuisance to a community. Some are detrimental to vegetable and animal life, depending entirely upon the concentration of the harmful components.

Plants of this nature are faced with the disposition of these gases. Among the methods used to remove acid gases and flue dust from the smoke are washing in scrubbing towers, the use of sprays, baffle chambers, bag houses for filtration or electrical precipitators, all more or less successful in reducing the quantity of fumes and dust. None have so far been successful in eliminating all the objectionable elements before entering the chimney.

Some of the above-mentioned methods tend to reduce materially the stack temperatures. Some contribute moisture to the gas stream, increase the acid mist and thus add to the undesirable activity of the dust and fume.

Chimneys 350 to nearly 600 ft. in height, discharging the gases at high elevations above the surrounding country, where they become diffused and diluted before reaching the earth, have become common. They may not serve the purpose perfectly, but their continued use is evidence that the results are not entirely unsatisfactory.

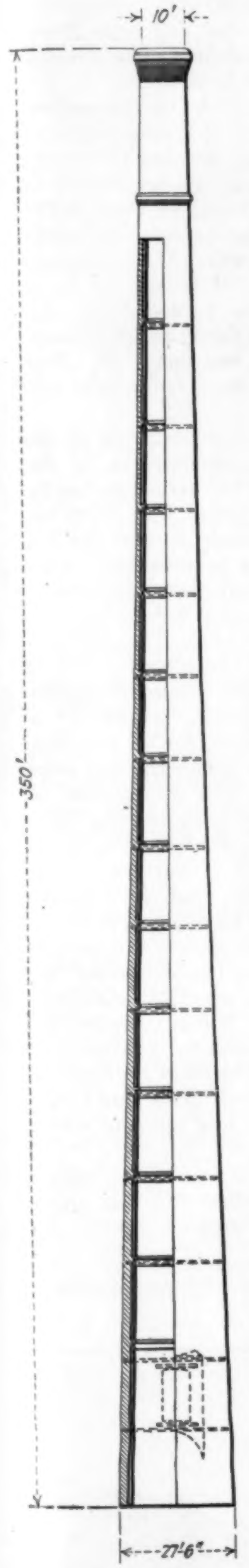
In chemical or industrial plants where the fumes are not acid, noxious or harmful but yet are disagreeable in their odor, the gases are easily disposed of by means of a camparatively tall chimney. As the smoke stream has no destructive content, no precautions need be taken against acid action. The fumes are carried to an altitude where their diffusion in the atmosphere greatly reduces any objectionable odors, if it does not entirely eliminate them.

The fine dust coming from roasting kilns, horizontal rotary kilns in the burning of lime, pyrites, sintering processes, etc., may be diffused to a marked degree by emitting the dust-carrying stream at a high altitude.

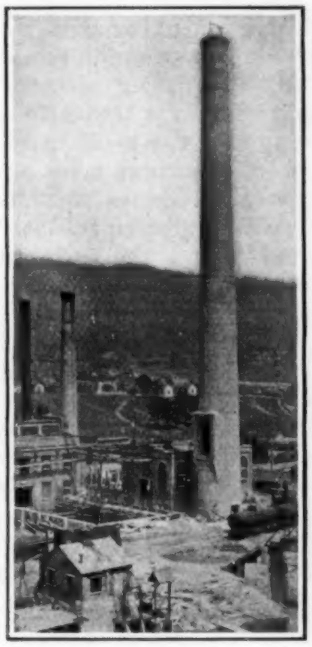
Of the many gases coming from these industries, such as those of the sulphur, nitric, chlorine, fluorine, lead and arsenic groups, the sulphur group is the most frequently encountered.

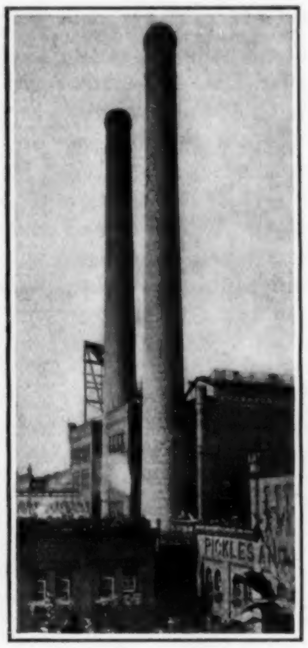
Those of the carbon family give little concern, as they are not particularly detrimental to a community nor do they tend to disintegrate a brick stack.

Sulphur trioxide, sulphur dioxide, compounds of lead and arsenious oxide are noxious and objectionable. The first of these attack to a marked degree common brick and ordinary mortar, concrete and steel and cannot be discharged safely through the ordinary chimney designed for use in connection with steam boilers burning coal.



A good example of the sectional lining that is frequently used in the construction of chimneys handling acid gases.



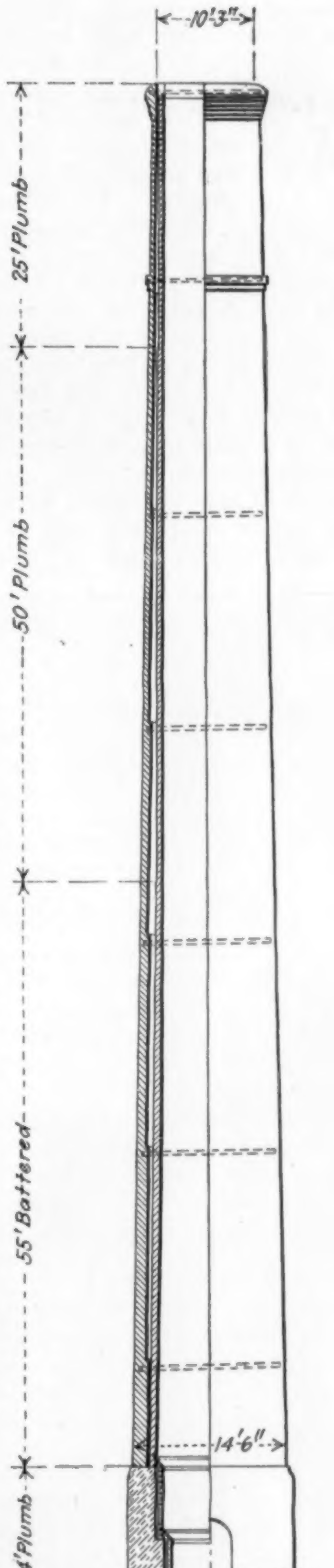


Sulphur dioxide gas in the pure state will condense to a liquid at about 14 deg. F. At any temperature above this it remains a gas and will not combine to form a damp acid mist nor liquid acid. If present in small quantities in the smoke stream at atmospheric pressure the condensation point is much lower. Therefore this particular gas has little or no effect on a brick chimney. At present it is only necessary to dilute the sulphur dioxide content of the smoke stream so that it will be harmless when it reaches the ground. This is being done through the use of tall chimneys safeguarded against the corrosive action of the gases by means of auxiliary furnaces to raise the temperatures. This is practiced by the American Smelting & Refining Co. and other companies.

Unlike sulphur dioxide, sulphur trioxide, even in low concentrations, will combine with the water vapor of the smoke screen and form a fog of sulphuric acid or even liquid sulphuric acid on the walls of the chimney. Of that which passes out of the chimney, some may eventually settle to the ground in the form of mist or dew, but the amount in any properly constructed plant is too small to cause trouble.

It is obvious that the temperatures at which an acid gas will become an acid liquid depend upon the concentration of water vapor and acid gases in the smoke stream. The greater the concentration of sulphur trioxide and water vapor the higher the temperature at which the condensation will take place. Unfortunately the sulphur gases are rather dilute and in the presence of moisture are more active than a more concentrated gas would be. As long as they remain gaseous, which for sulphur trioxide means over 400 deg. F., they have little effect upon hard-burned impervious brick commercial acid-proof mortar. Some authorities give the condensation point of the sulphur trioxide under the above conditions as low as 275 deg. F., but the best practice is to maintain a temperature of the smoke stream of 400 deg. F. or over.

The fumes of chlorine and nitrous oxide under certain conditions attack common brick and mortar, concrete, unvitrified tile, steel and the common metals. The effect on these materials, particularly in the presence of moisture and low temperatures, is practically the



Another style of chimney for acid gases with complex independent lining and the flue led to it underground.

same as the effect of sulphur trioxide. A structure to stand up against them should follow the same general design and use of materials as one built to resist the action of sulphuric acid. The disposition of the chlorine and nitrous oxide fume at high altitudes is common practice. Here, too, if the products of combustion carrying these two gases have a low temperature, auxiliary furnaces are employed to raise the temperature. This gives added velocity to the smoke stream, decreases its density and causes it to rise considerably above the top of the chimney. The diffusion in the atmosphere is thus more completely accomplished.

The most important thing in handling acid gases in a chimney is to maintain a high internal temperature. This often destroys the detrimental effect of the gases on the masonry. Furthermore, the higher the temperatures of the emitted gases at the top of the stack the higher the fumes and fine acid mist will ascend, the greater their dilution before reaching the ground. This is a most important fact to the management of smelters and chemical plants, especially where they have sulphur dioxide to contend with.

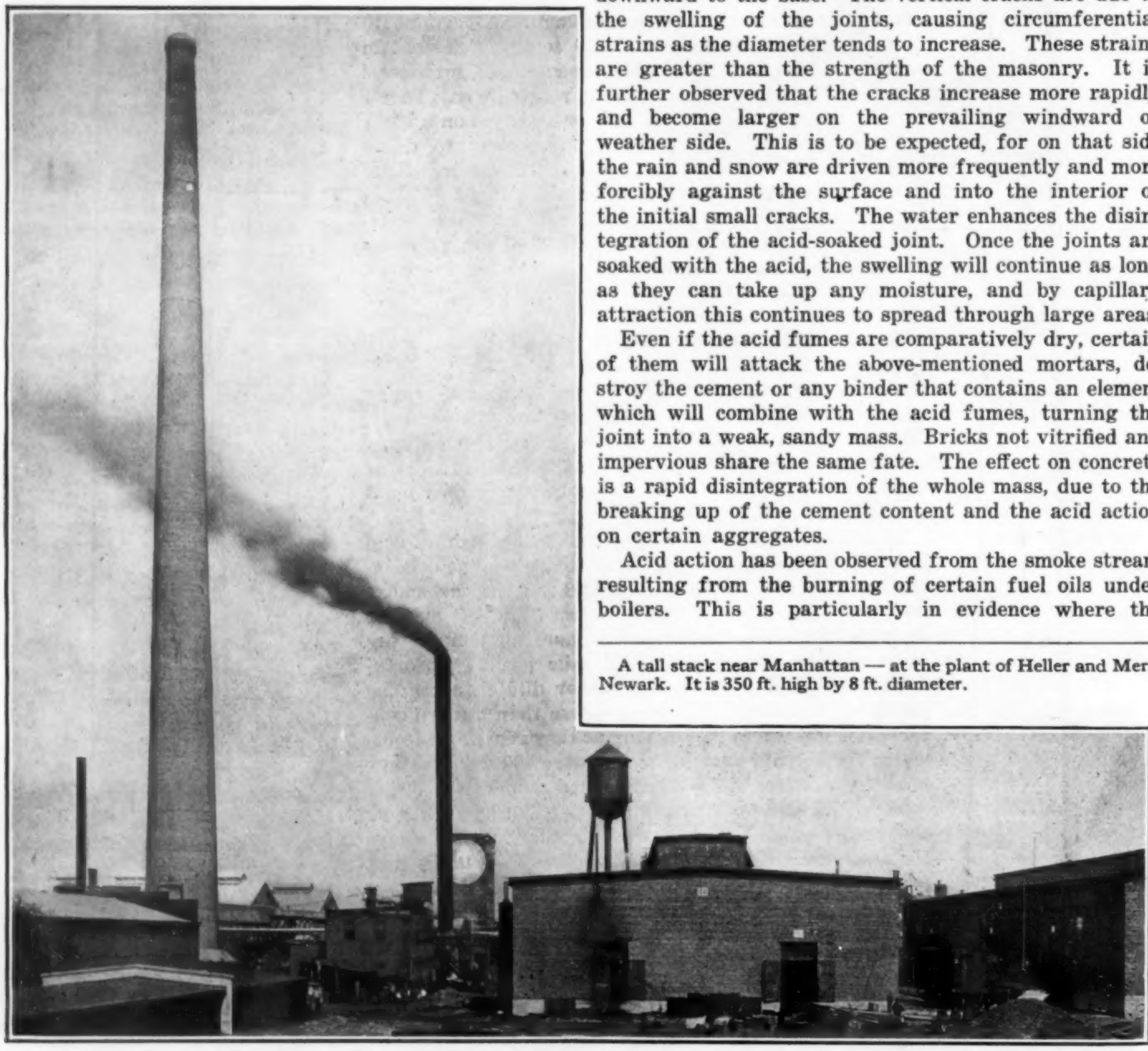
A wet or damp acid smoke stream in contact with ordinary mortars made of cement, lime and sand, or sand and cement, or with certain commercial mortars which do not contain cement and lime, produces a swelling and puffing of both the bed and cross joints accompanied by a tremendous pressure. The swelling amounts at times to 25 to 30 per cent.

A chemical change takes place at first on the surface. The mortar becomes soft and of the consistency of mud. As time goes on this softening and swelling works entirely through the walls, causing the brick work to bulge and crack. Steel bands are useless, even on the outside, for the masonry will bulge between the bands and in time the bands will give way. If the temperatures are raised or the chimney dries out, the inner portion of the joints may become hardened but still remain swelled. If the brick is not hard and impervious, the exposed portion becomes soft and flakes off. This process continues until the whole brick is changed into a soft mass.

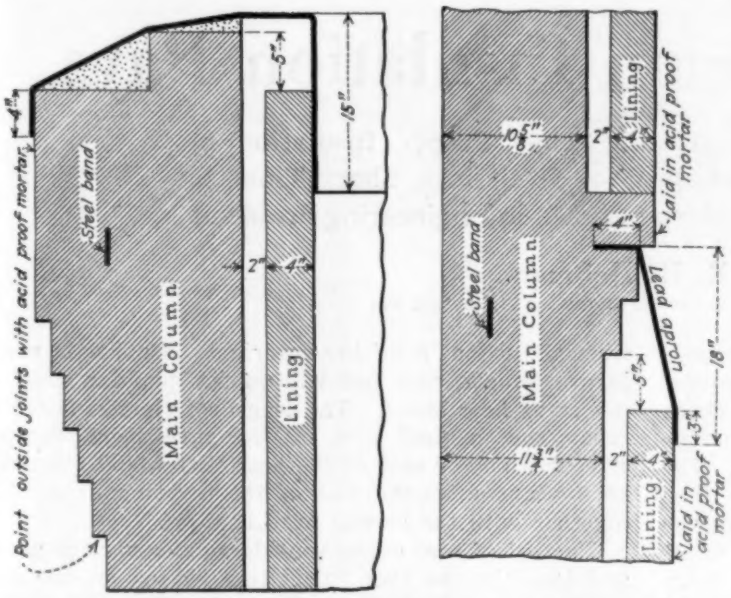
Cases have been observed where the swelling of the joints is quite uniform in the circumference of the chimney and irregular bulging of the structure hardly discernible. The disintegration takes the form of vertical cracks. These usually appear first at the top where the walls are thinnest and in time they work downward to the base. The vertical cracks are due to the swelling of the joints, causing circumferential strains as the diameter tends to increase. These strains are greater than the strength of the masonry. It is further observed that the cracks increase more rapidly and become larger on the prevailing windward or weather side. This is to be expected, for on that side the rain and snow are driven more frequently and more forcibly against the surface and into the interior of the initial small cracks. The water enhances the disintegration of the acid-soaked joint. Once the joints are soaked with the acid, the swelling will continue as long as they can take up any moisture, and by capillary attraction this continues to spread through large areas.

Even if the acid fumes are comparatively dry, certain of them will attack the above-mentioned mortars, destroy the cement or any binder that contains an element which will combine with the acid fumes, turning the joint into a weak, sandy mass. Bricks not vitrified and impervious share the same fate. The effect on concrete is a rapid disintegration of the whole mass, due to the breaking up of the cement content and the acid action on certain aggregates.

Acid action has been observed from the smoke stream resulting from the burning of certain fuel oils under boilers. This is particularly in evidence where the



A tall stack near Manhattan — at the plant of Heller and Merz, Newark. It is 350 ft. high by 8 ft. diameter.



Left shows in detail the chimney head and the so-called protecting cap indicated by the heavy black line at the top. In case of corrosive gases it is made of lead. This construction gives plenty of leeway for expansion of lining without affecting the cap.

Right—With some chimneys it is essential to introduce an expansion space of this kind at various points in the stack.

sulphur content of the oil is high and steam atomizing burners are used. In the installation, especially in connection with economizers resulting in low flue temperatures, and when the chimneys are high, the protection of the upper portion should have the attention of a designing engineer. It all depends upon the sulphur content of the oil and the flue temperatures. Smoke from many fuel oils has no effect on the brick lining designed for coal-burning steam boilers.

In designing a chimney for acid duty it is necessary to protect perfectly the main walls by an independent lining for the full height of the structure, with an ample air space between it and the main walls. An air space of not less than 3 or 4 in. at any point is recommended. In fact, the design is a chimney within a chimney.

The independent inner lining must be built of impervious, practically vitrified, brick very low in lime and laid up in acid-proof mortar—that is, acid-proof mortar made to resist the particular kind of acid in the smoke stream. The thinnest possible joint is imperative. The bricks should be thinly buttered or dipped and struck tightly into place. Many commercial acid-proof mortars are acid-proof against certain acids so long as the acid gases are dry and of a comparatively high temperature. These are often composed of a mixture of pure clay, silica sand or silex, kaolin, asbestos fiber, china clay, graphite products, ground gypsum and the like. A common binder is silicate of soda. These mixtures are not always acid-proof and often break up under the action of moisture. They soften, swell and disintegrate under a wet acid. So the mortar must not only be acid-proof but be moisture-proof. A pure silica sand only should be used.

The top of the chimney should be protected with a cap covering both the lining and the main walls, and made of material not affected by the particular kind of acid under consideration. Ample room should be allowed for the lining to expand upward and outward. Furthermore, the cap should be so designed that no dust, fumes or moisture can find their way down between the main walls and the lining. It will be noted that with this design the lining has room to expand upward without lifting the cap. The air space is protected.

With certain acid conditions the cap may be made of lead. On the other hand, certain acids will affect lead—not necessarily disintegrate it, but cause it to buckle. With other acid conditions a cap of Monel metal has been used with success. The choice of material is dependent entirely upon the nature of the acid.

The gases coming from the top of a chimney are often blown down outside for distances varying from 25 to 100 ft. For that reason the same acid-proof mortar used in the lining should be used on the outside joints of the upper portion of the main walls. Since this surface is exposed to the weather, it is most necessary that the mortar be weather-proof. Common building lime should never be used in any part of the structure.

In some cases where the temperature of the acid smoke stream is continually high and the acids not very active, the same brick and mortar may be used and a sectional lining constructed in place of an independent lining. This form of construction is less expensive. The corbels built out at intervals from the main walls and supporting the lining should have the inner joints pointed with acid-proof mortar.

On the top of each corbel an apron of an acid-proof material should be set in such a manner that the lower lip projects down over the top of the section of lining below. The air space is then protected. In addition to this the upper 12 in. or so of the air space under each corbel should be packed with flexible material not affected by the particular acid encountered.

Protecting Accessories from Fume

Where lightning rods are installed on acid chimneys, the upper 50 ft. or more of the complete rod should be sheathed to protect the copper from effects of the acid. Lead covering is in most cases effective. All chimneys handling acid gases should be equipped with an outside ladder, the upper portion of which should be covered with lead or an acid-resisting material. Chimneys that have been in practically continuous service for years without showing any effect from the smoke stream have been observed to develop defects, particularly in the upper portions, after they have been shut down for a protracted period.

Although the conditions of temperature, dilution, acid mixture and the like may be such as not to cause damage while the chimney is in operation, yet an accumulation of dust on the inner walls, which is deliquescent by virtue of its acid content, may tend to do damage when the chimney is not in operation.

The weather, rain, fog, snow or a heavy humid atmosphere furnishes the necessary water within the chimney to convert the previously inert dust with an acid content into a liquid acid which immediately becomes active.

It is, therefore, wise when the chimney is shut down for a period to cover the entire opening at the top with a temporary weather-proof lid. This can be made in sections of light wood easily placed and removed. Lugs protected against acid action should be built into head to which the sections of the temporary lid may be fastened.

Superheated Steam Insulation Pays

This Investigation, Demonstrating That Proper Insulation of Superheated Steam Surfaces Pays for Itself in a Short Time, Is Typical of the Increasing Interest Shown in Engineering Problems

By R. H. Heilman

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THE main object of this paper is to show the relatively short time required to repay the original cost of the installations and the relatively large return per year on the investment that can be effected by the proper insulation of superheated steam surfaces. The fact that a 4-in. thickness of pipe covering, when applied to an 18-in. pipe operating at a temperature of 900 deg. F., will pay for itself in a period of 21 days with steam at only 35 cents per 1,000,000 B.t.u. is of sufficient importance to arouse the interest of any engineer at all concerned with the conservation of fuel.

There are many instances where the proper insulation of exposed or underinsulated surfaces would repay the original cost many times over in one year; for example, exposed fittings, under insulated steam lines, boilers, ovens and temporary heating appliances used in chemical and plant laboratories. The fact that pipes are covered does not end the possibility of heat losses. It is the poorest economy to use a minimum thickness of covering on high-pressure lines and apparatus when the use of a thicker covering will not only result in greater efficiency but will quickly pay for itself in the extra heat saved. The length of time required to repay the original cost of the investment depends of course on the cost of the heat that would otherwise be lost and upon the cost of the covering as applied, together with the annual fixed charges.

The cost of heat varies considerably in various plants and localities, so that calculations based on one cost of steam would obviously be applicable only to that particular case. Some of the factors that influence the cost of steam are cost of fuel, heat content of the fuel, efficiency of the installation, method of firing, load factor, charges against the investment in boiler plant, and operating charges.

Some of the factors that influence the cost of the insulation as applied are initial cost of material, labor rate per hour, amount of cement work compared with straight pipe and blocks, number of fittings and bends compared with straight pipe, accessibility of pipes, painting, weight of canvas and application of canvas (pasted or stitched).

Before compiling the tables herewith, the author

Abstract from a paper presented at the Pittsburgh meeting, American Institute of Chemical Engineers, December, 1924.

Table I—Savings Per Year and Time Required to Repay Original Cost

Pipe temperature, deg. F.		500			600			700			800			900		
Fuel cost		$0.15	$0.25	$0.35	$0.15	$0.25	$0.35	$0.15	$0.25	$0.35	$0.15	$0.25	$0.35	$0.15	$0.25	$0.35
2" pipe	Material	2" thick Mg			1" th. H.T. 1½" th. Mg			1" th. H.T. 1½" th. Mg			1" th. H.T. 2" th. Mg			1" th. H.T. 2" th. Mg		
Covering and	Months req.	8.50	5.10	3.63	7.70	4.60	3.30	5.50	3.30	2.30	5.10	3.10	2.20	4.10	2.40	1.70
appl. list	Saving per yr.	1.28	2.22	3.17	1.93	3.34	4.74	2.77	4.73	6.69	3.78	6.47	9.13	4.85	8.23	11.62
4" pipe	Material	D. S. Mg			1" th. H.T. 2" th. Mg			1" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg		
Covering and	Months req.	6.50	3.90	2.80	7.10	4.20	3.10	5.00	3.10	2.20	4.40	2.60	1.90	3.40	2.00	1.50
appl. list	Saving per yr.	2.42	4.15	5.89	3.21	6.31	8.81	5.20	8.86	12.54	7.13	12.11	17.11	9.31	15.75	22.20
6" pipe	Material	3" thick Mg			1" th. H.T. 2" th. Mg			1" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg		
Covering and	Months req.	8.50	5.10	3.50	5.90	3.50	2.50	4.20	2.50	1.80	3.60	2.20	1.60	2.80	1.70	1.20
appl. list	Saving per yr.	3.48	6.05	8.60	5.34	9.14	12.94	7.68	13.06	18.39	17.11	17.72	24.97	13.79	23.27	32.77
8" pipe	Material	3" thick Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg		
Covering and	Months req.	7.60	4.60	3.30	6.30	3.80	2.70	4.50	2.70	1.90	3.00	1.80	1.30	2.30	1.40	1.00
appl. list	Saving per yr.	4.55	7.86	11.17	6.94	11.90	12.86	10.00	17.00	24.00	13.69	23.15	32.64	18.05	30.39	42.79
10" pipe	Material	3" thick Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg		
Covering and	Months req.	7.10	4.20	3.00	6.00	3.60	2.60	4.30	2.60	1.80	3.20	1.90	1.40	2.40	1.50	1.00
appl. list	Saving per yr.	5.73	9.85	13.99	8.65	14.81	21.00	12.43	21.10	29.88	17.05	28.80	40.50	22.50	37.90	53.30
12" pipe	Material	3½" thick Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg		
Covering and	Months req.	7.80	4.70	3.40	5.50	3.30	2.40	3.90	2.30	1.70	3.50	2.10	1.50	2.70	1.60	1.20
appl. list	Saving per yr.	6.71	11.59	15.49	10.28	17.56	24.85	14.80	25.10	36.40	20.10	33.10	37.10	26.60	44.80	63.20
14" pipe	Material	3½" thick Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg		
Covering and	Months req.	8.20	4.90	3.50	5.40	3.20	2.30	3.90	2.40	1.70	3.40	2.00	1.50	2.60	1.60	1.10
appl. list	Saving per yr.	7.89	12.64	17.99	11.58	19.78	27.98	16.18	27.38	38.18	22.04	37.44	52.64	29.16	49.16	69.16
16" pipe	Material	3½" thick Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg		
Covering and	Months req.	8.80	5.30	3.80	5.40	3.30	2.30	3.80	2.30	1.60	3.40	2.00	1.40	2.80	1.50	1.10
appl. list	Saving per yr.	7.52	13.10	19.60	12.75	21.80	20.84	18.40	21.20	44.00	25.15	42.55	59.95	33.15	55.95	78.65
18" pipe	Material	3½" thick Mg			1½" th. H.T. 2" th. Mg			1½" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg			2" th. H.T. 2" th. Mg		
Covering and	Months req.	7.80	4.70	3.30	5.30	3.20	2.30	3.70	2.20	1.60	3.20	1.90	1.40	2.50	1.50	1.10
appl. list	Saving per yr.	9.34	15.16	22.96	14.39	24.57	34.73	20.73	35.13	49.63	28.33	47.98	67.48	38.18	62.98	88.48
Flat surface	Material	4" thick Mg			1½" th. H.T. 2½" th. Mg			1½" th. H.T. 2½" th. Mg			2" th. H.T. 2½" th. Mg			2" th. H.T. 2½" th. Mg		
Covering and	Months req.	7.00	4.20	3.00	4.70	2.80	2.00	3.30	2.00	1.40	2.70	1.60	1.20	2.10	1.30	0.90
appl. list	Saving per yr.	1.91	3.28	4.66	2.92	4.98	7.03	4.19	7.09	.....	5.76	9.72	13.70	7.57	12.72	17.88

Table II—Price Lists

Adopted Aug. 1, 1907
85% Carbonate of Magnesia Pipe-Coverings
For Wrought-Iron Pipes

Nominal Pipe Size, In.	Thickness of Standard Covering, In.	Price Per Linear Foot Canvas Jacketed	Thickness of Covering, In.	Price Per Linear Foot Canvas Jacketed	Thickness of Covering, In.	Price Per Linear Foot Canvas Jacketed	Double Layer Double Standard Thickness, In.	Price Per Linear Foot Canvas Jacketed	Double Layer Total Thickness, 3 In.	Price Per Linear Foot Canvas Jacketed
½	¾	$0.22	1½	$0.46	2	$0.75	1½	$0.6	3	$1.02
¾	¾	.24	1½	.49	2	.80	1½	.70	3	1.35
1	¾	.27	1½	.52	2	.85	1½	.75	3	1.40
1¼	¾	.30	1½	.56	2	.90	1½	.80	3	1.45
1½	¾	.33	1½	.60	2	.95	1½	.85	3	1.55
2	1 1/32	.36	1½	.64	2	1.00	2 1/16	.90	3	1.65
2½	1 1/32	.40	1½	.70	2	1.05	2 1/16	1.00	3	1.75
3	1 1/32	.45	1½	.76	2	1.15	2 1/16	1.10	3	1.90
3½	1 1/32	.50	1½	.82	2	1.25	2 1/16	1.20	3	2.05
4	1⅛	.60	1½	.88	2	1.35	2¼	1.40	3	2.20
4½	1⅛	.65	1½	.94	2	1.45	2¼	1.50	3	2.35
5	1⅛	.70	1½	1.00	2	1.55	2¼	1.60	3	2.50
6	1⅛	.80	1½	1.10	2	1.70	2¼	1.80	3	2.70
7	1¼	1.00	1½	1.20	2	1.85	2½	2.25	3	2.90
8	1¼	1.10	1½	1.35	2	2.00	2½	2.50	3	3.15
9	1¼	1.20	1½	1.50	2	2.20	2½	2.70	3	3.40
10	1¼	1.30	1½	1.65	2	2.40	2½	2.90	3	3.65
*12	1½	1.85	1½	1.85	2	2.70	3	4.10	3	4.10
14	1½	2.10	1½	2.10	2	3.00	3	4.60	3	4.60
16	1½	2.35	1½	2.35	2	3.30	3	5.10	3	5.10
18	1½	2.60	1½	2.60	2	3.60	3	5.60	3	5.60
20	1½	2.85	1½	2.85	2	4.00	3	6.00	3	6.00
24	1½	3.30	1½	3.30	2	4.50	3	7.00	3	7.00
30	1½	4.00	1½	4.00	2	5.50	3	8.40	3	8.40

* All coverings larger than 10 in. furnished in segment form; jackets and bands not included.

Double standard thickness—the inner layer is furnished in sections for pipe sizes up to and including 10 in., and in curved blocks for larger sizes. The outer layer is furnished in sections for pipe sizes up to and including 8 in. and in curved blocks for larger sizes.

Double 1½-in. thickness—the inner layer is furnished in sections for pipe sizes up to and including 10 in., and in curved blocks for larger sizes. The outer layer s furnished in sections for pipe sizes up to and including 7 in., and in curved blocks for larger sizes.

85% Carbonate of Magnesia Blocks
For Covering Boilers and Similar Surfaces

Thickness, In.	Price Per Sq.Ft.	Thickness, In.	Price Per Sq.Ft.	Thickness, In.	Price Per Sq.Ft.	Thickness, In.	Price Per Sq.Ft.
¾	$0.30	1½	$0.45	2⅛	$0.64	2¾	$0.83
1	.30	1⅝	.49	2¼	.68	2⅞	.87
1⅛	.34	1¾	.53	2⅜	.72	3	.90
1¼	.38	1⅞	.57	2½	.75	3¼	.98
1⅜	.42	2	.60	2⅝	.79	3½	1.05
						4	1.20

Standard block sizes, 6x36 in. and 3x18 in.

corresponded with ten representative firms of consulting engineers in the power-plant field in regard to the cost of steam and specifications for thickness of material used as standard practice in insulating superheated steam lines. The cost of steam for the firms corresponded with was found to vary from 14 to 50 cents per 1,000,000 B.t.u. The cost and application of the covering varies for different plants, as mentioned above. However, one large pipe-covering contractor finds for his work that in general the actual cost of covering for superheated steam lines to the central station in place and finished is approximately the list net price of the covering.

The price list of 85 per cent magnesia covering is shown in Table II. This list is used in quoting prices on all types of covering on the market at present. The actual cost of any given type of insulation is quoted at so many points off the list price.

In order to form a definite comparison, the author has chosen for the cost of covering as applied, list net, and the cost of fuel at the boiler nozzle of 15, 25, and 35 cents per 1,000,000 B.t.u. There are many cases where the actual cost and application of pipe covering will exceed the list price of the covering and there are also many cases where the cost of steam will greatly exceed 35 cents per 1,000,000 B.t.u.

In order to make intelligent use of the tables shown it will be necessary for the engineer first to determine the cost of steam for his particular case and the approximate cost of the covering in terms of the list price. If these costs do not correspond with those given in the tables, it will be necessary to interpolate. The tables show the time required to repay the original cost of the covering and its application, and also the savings in dollars per year per linear foot of pipe and per square foot of flat surface, for various temperatures and pipe sizes. In computing the tables "Hi-Temp" and 85 per cent magnesia have been used as the insulation. The most economical thickness has been used for the average of the steam costs assumed and the thickness of the "Hi-Temp" as the inner layer has been chosen so that the temperature at the inner surface of the magnesia next to the "Hi-Temp" will not exceed 550 deg. F.

The thicknesses used in these tables can safely be used for other insulations having approximately the same conductivity as "Hi-Temp" and magnesia and can be considered as standard practice for superheated steam temperatures, as they have been worked out on a scientific basis and also in accordance with the standard thicknesses of coverings as manufactured for the different pipe sizes.

It should be noted that the temperatures given are pipe temperature and not superheated steam temperatures. There has been considerable discussion lately on the temperature drop from the superheated steam

Table III—Cost of Steam Per 1,000,000 B.t.u.

Boiler Efficiency, Per Cent	Coal — Cost Per Ton 2,000 Lb.			Oil — Cost Per Bbl. 327 Lb.			Natural Gas — Cost Per 1,000 Cu.Ft.			Artificial Gas — Cost Per 1,000 Cu.Ft.		
	$3.00	$4.00	$5.00	$1.00	$1.25	$1.50	$0.40	$0.50	$0.60	$1.00	$1.25	$1.50
50	$0.23	$0.31	$0.38	$0.32	$0.40	$0.48	$0.80	$1.00	$1.20	$3.33	$4.16	$5.00
60	0.19	0.26	0.32	0.27	0.34	0.40	0.67	0.83	1.00	2.78	3.47	4.17
70	0.16	0.22	0.27	0.23	0.29	0.34	0.57	0.71	0.86	2.38	2.98	3.57
80	0.14	0.19	0.24	0.20	0.25	0.30	0.50	0.62	0.75	2.08	2.60	3.12
90	0.13	0.17	0.21	0.18	0.22	0.27	0.44	0.55	0.67	1.85	2.31	2.78

to the wall of the pipe, some engineers maintaining that in certain cases the drop is considerably over 100 deg., while others say that it is only a few degrees. The author has made no study of this problem, but thinks that in most practical cases the drop is comparatively small. Recent practical tests by one large power plant gave only a few degrees drop.

In making the calculations, a room temperature of 70 deg. F. has been assumed and the yearly fixed charges for the covering have been taken as 13 per cent of the cost of the covering applied (6 per cent interest, 5 per cent deterioration, 2 per cent miscellaneous).

To assist any one who desires to check these tables or who wishes to calculate the savings for some particular case of his own, an example is worked out showing the method used in determining the values given in the tables.

Determine the length of time required to pay for the installation and the saving per year per linear foot length of pipe for a 12-in. pipe at a temperature of 700 deg. F., when insulated with 1½ in. of "Hi-Temp" and 2 in. of 85 per cent magnesia. The cost of steam at the boiler nozzle is assumed to be 35 cents per 1,000,000 B.t.u., the cost of the covering when applied is assumed as list net, and the room temperature is 70 deg. F.

The heat loss through the insulation will be calculated first, because it is the most difficult part of the problem. In order to determine the heat loss through the insulation, it is necessary to know the temperatures at the inner and outer surfaces and the conductivity of the material at the mean temperature between the two surfaces. Since in this case only the pipe temperature and room temperature are known, it is necessary to determine the outer surface or canvas temperature. Probably the simplest procedure for calculating the heat loss through a compound covering is to make an assumption of the outer surface temperature and the temperature between the two types of insulation or at the outer surface of the "Hi-Temp" and the inner surface of the magnesia, then from the conductivity curves determine the conductivity of the materials at the mean of the surface temperatures assumed. The loss through the covering should then be calculated for the assumed outer temperature, and this loss should be checked against the loss as obtained by substitution in the surface loss-equation.

If the two losses do not check, the assumed outer surface temperature and the assumed temperature at the junction of the two materials must be changed according to the indications of the calculation and the process repeated until the two losses or the outer surface temperatures check.

The equation for compound sections on a cylindrical surface in terms of heat loss per square foot of outer surface is

$$h = \frac{T_1 - T_2}{\dfrac{r_3 \log_e \frac{r_2}{r_1}}{K_1} + \dfrac{r_3 \log_e \frac{r_3}{r_2}}{K_2} + \ldots} \qquad (1)$$

in which

T_1 = temperature at inner surface of insulation.

T_2 = temperature at outer surface of insulation.

r_3 = radius of outer surface of insulation.

r_1 = radius of inner surface of insulation.

r_2 = radius between first and second layer of insulation.

K_1 = thermal conductivity of first layer of insulation.

K_2 = thermal conductivity of second layer of insulation.

For a 12-in. pipe

$r_1 = 6.375 \quad r_2 = 7.875 \quad r_3 = 9.875$

$r_3 \log_e \frac{r_2}{r_1} = 2.09$

$r_3 \log_e \frac{r_3}{r_2} = 2.23$

First, a canvas temperature of 125 deg. F. is assumed. The total drop in temperature through the two coverings then is 700 — 125 = 575 deg. F. The next step is to assume the temperature drop through each insulation, in order to determine the conductivity value to use. No rule can be given for the first assumption; but it will be found that the second assumption can be calculated fairly closely. The conductivity of "Hi-Temp" is higher than that of magnesia, but the material which is applied next to the pipe is more effective than the second layer of material, other things being equal, so there is first assumed a drop of 250 deg. F. through "Hi-Temp" with the remaining drop of 325 deg. F. through magnesia. The temperature between the "Hi-Temp" and the magnesia covering then is 700 — 250 = 450 deg. F.

The mean temperature of "Hi-Temp" is $\frac{700 + 450}{2} = 575$ deg. F., and $K_1 = 0.651$. The mean temperature of magnesia is $\frac{450 + 215}{2} = 287.5$ deg. F., and $K_2 = 0.502$.

Substituting the value obtained above in equation 1,

$$h = \frac{700 - 125}{\dfrac{2.09}{0.651} + \dfrac{2.23}{0.502}} = \frac{575}{3.21 + 4.45} = 75.1 \text{ B.t.u.}$$

Substituting this value in the surface-loss equation

$$Td = \frac{272.5h}{h + \dfrac{564}{D^{0.18}}}$$

where h is heat loss in B.t.u. per sq.ft. of outer surface,

Td = temperature difference between pipe surface and room temp.

D = outer diameter of pipe in inches.

Values for $\frac{564}{D^{0.18}}$ are obtained from tables which have appeared in earlier papers (*Mech. Eng.*, vol. 46, No. 10, October, 1924) as has also considerable earlier work on the conductivity of insulating materials. For this calculation we may assume a value of 320.

We then obtain

$$Td = \frac{272.5 \times 75.1}{75.1 + 320} = 51.7$$

This indicates that 55 deg. F. temperature difference between canvas temperature and room temperature first chosen was too high and there is next assumed a temperature difference of 52 deg. F., or a canvas temperature of 122 deg. F., since the canvas temperature will generally be fairly close to the canvas temperature first obtained by substituting in the surface-loss equation.

The temperature drop through "Hi-Temp" for the foregoing calculation was approximately 3.21 × 75.1, or 241 deg. F. Since there has been assumed a canvas temperature decrease of 3 deg. F., there will be assumed a corresponding increase in the drop through the covering, or the temperature drop through "Hi-Temp" as 242 deg. F., and the drop through magnesia as 336 deg. F., with the temperature between the "Hi-Temp" and magnesia covering as 458 deg. F.

The mean temperature of "Hi-Temp" then is $\frac{700 + 458}{2} = 579$ deg. F., and $K_1 = 0.652$. The mean temperature of the magnesia covering is $\frac{458 + 122}{2} = 290$ deg. F., and $K_2 = 0.503$.

Then

$$h = \frac{578}{\dfrac{2.09}{0.652} + \dfrac{2.23}{0.503}} = \frac{578}{3.21 + 4.44} = 75.5 \text{ B.t.u.}$$

Checking again for the canvas temperature difference,

$$Td = \frac{272.5 \times 75.5}{75.5 + 320} = 52 \text{ deg. F.}$$

This value checks with the last value of 52 deg. F. assumed; also the drop through the "Hi-Temp" = 3.25 × 75.5 = 242, which checks with the value last assumed, and the heat loss is 75.5 B.t.u.

The total heat loss per square foot of pipe surface per hour is then $75.5 \times \frac{9.875}{6.375} = 116.8$ B.t.u.

From curves presented in a previous paper (see *Chem. & Met.*, vol. 27, July 12, 1922, p. 64, Fig. 1) the heat loss from a bare 12-in. pipe at 630 deg. F. temperature difference = 630 × 5.74 = 3,617 B.t.u. The saving then = 3,617 — 117 = 3,500 B.t.u. per square foot of pipe surface per hour. The saving per linear foot of pipe = 3,500 × 3.344 = 11,700 B.t.u. per hour. With the cost of steam at 35 cents per 1,000,000 B.t.u., the saving in dollars per year =

$$\frac{11{,}700 \times 8{,}760 \times 0.35}{1{,}000{,}000} = 36.05.$$

From Table II the list price of 1.5-in. "Hi-Temp" and 2-in. magnesia on 12-in. pipe is approximately \$5. The annual fixed charges have been assumed as 13 per cent of the cost of covering and application, or, in this case, 13 per cent of list net = 5 × 0.13 = \$.65.

The net annual saving then = 36.05 — 0.65 = \$35.40 per foot length of pipe. The time required to repay the original cost of the installation = $\frac{12 \times 5}{36.05} = 1.66$ months, or approximately 50 days.

Table III gives the cost of steam per 1,000,000 B.t.u. for various types of fuel at various costs and when burned under various boiler efficiencies. In compiling this table the heat content of coal has been taken as 13,000 B.t.u. per lb., fuel oil at 19,000 B.t.u. per lb. (327 lb. per barrel), natural gas at 1,000 B.t.u. per cu.ft., and artificial gas at 600 B.t.u. per cu.ft.

By the aid of the tables presented in this paper it is hoped that any one concerned with the conservation of fuel will be able to determine just what saving can be effected under any given condition. While the tables show the savings in terms of dollars and cents and in terms of the time required to repay the original cost of the investment, they can readily be transferred to tons of coal, barrels of oil, etc.

Impressing the individual with the savings to be effected in dollars and cents will more readily convince him of the value of the savings in terms of coal or gas and thus help to conserve the rapidly diminishing natural fuel resources of this country.

Italian Chemical Industries Prosperous

Led by a very active artificial silk industry, chemical industries in Italy are very generally prosperous. They now have more than half a billion gold lire of paid-in capital and are employing in excess of 100,000 persons. The number of chemical plants in the country is approaching 1,000.

Readers' Views and Comments

An Open Forum

The editors invite discussion of articles and editorials or other topics of interest

Lumber Waste and the Technologist's Opportunity

To the Editor of Chemical & Metallurgical Engineering:

Sir—Your editorial on "Lumber Waste and the Technologist's Opportunity" correctly characterizes a technical situation in the Pacific Northwest which is indefensible. Our lumber mills vie with one another in the ease with which they can get the waste out of sight. The writer has had this industry under observation for 20 years and has come to the conclusion that the industry as a whole can think only in terms of two dimensions—viz., the dollar mark and feet board measure.

It is the technologist's opportunity. Nevertheless, technologists are often poor salesmen and although experienced chemical engineers have time and again advised that the opportunity for the complete utilization of lumber waste is favorable in the Pacific Northwest, no evidence of heeding such advice can be discerned. In addition to the causes of apathy you mention, is it not also true that industries dependent upon science must be initiated by those who can think in terms of the process involved? If so, we can expect nothing from the lumber industry, but must await the coming of technologists with resources to launch such an enterprise.

H. K. BENSON.

Seattle, Wash.

Chemical Ingenuing

To the Editor of Chemical & Metallurgical Engineering:

Sir—I am forced to send out a word of protest to the pert article entitled "Chemical Ingenuing" in the Nov. 24 issue of *Chem. & Met.* Monsieur Anonymous having accidentally come across an article by L. M. Hussey in the *American Mercury* on the American Chemist has become so entranced with the few patches of literature that is being so laboriously produced in these states that he has voraciously pursued the leader of this coterie and found himself actually captivated by Mr. Mencken's Prejudices: Third Series. Well, to actually find a self-conscious chemist who has caught a glimpse of gusto, is a matter for national rejoicing. I wonder . . . if this does not indicate we will some day actually find one ensconced behind a still reading Edgar Allan Poe, as an English literatus one time discovered a disreputable looking Italian seated in the woods on Staten Island reading the Divina Comedia.

Probably you think I belabor the point when I insist that Anonymous has been captivated. If so then kindly turn to the first sentence of page 15 of Mencken's book and compare it with the last sentence of column two in "A Posteriori" of the above article. With all candor I ask you if this bedecking of a jewel sentence is an improvement or not? I recommend the article "On Being an American" in its entirety for those who care about living as well as cutting a dubious niche in the wall of science.

After reading this essay by Mencken then turn to Chemical Ingenuing and you have a perfect example of the difference between mere bombast and pedantry and an elegantly proportioned piece of literature. Personally I am not a bit amused by the spectacle of a Herr Professor cavorting in the skin of a homme du monde. The idea is good, but the form is atrocious. Diligence may in time achieve the fusion. In the meantime praise be to Allah for someone bold enough to point the way. Who knows, maybe the mantle of Huxley will fall on some animalcule caught in the stream.

East Orange, N. J. REIMAN G. ERWIN.

Synthetic Ammonia in France

To the Editor of Chemical & Metallurgical Engineering:

Sir—The article "Solving the Fertilizer Problem for France" on p. 658 of your Oct. 27 issue contains some statements that are incorrect.

As the exclusive licensors of the Casale process in France, permit us to state that the Société Ammonia, the Société Kuhlmann and the Société Solvay have been licensed by us to use the Casale process in France and thus cannot use the Claude process. Similarly, we wish to call your attention to the fact that at the Toulouse powder works the French Government is going to make synthetic ammonia with equipment operating according to the Casale process.

COMPAGNIE DE PRODUITS CHIMIQUES ET ELECTROMÉTALLURGIQUES.

126 Rue La Boëtie, Paris, VIII.

EDITOR'S NOTE—The above statement is also of interest in connection with the list of licensees of the Casale process published in our Nov. 24 issue, p. 832. With reference to the license held by the French Ministry of War we have since been informed that the Toulouse installation will consist of nine units, each to produce 20 tons per day.

Can You Use High-Grade Pyrites?

To the Editor of Chemical & Metallurgical Engineering:

Sir—We have recently been making a product that is practically pure iron pyrites, the product being made by flotation from the tailing of a copper concentrating mill. The product as at present produced runs between 49 and 50 per cent in sulphur, and contains possibly 4 or 5 per cent of foreign matter. Pure iron pyrites is supposed to assay 53 per cent sulphur. Our product has been crushed so that approximately 60 per cent of it passes a 200-mesh screen, and the remainder of it will all pass a 60-mesh screen. It will be possible to modify our product so as to produce a still higher grade product, and the foreign ingredients might be reduced to 2 per cent or less. We have recently received an intimation that there may be a demand for such an extremely pure product in Europe, and it has occurred to us that there may be a demand for such a product in the United States.

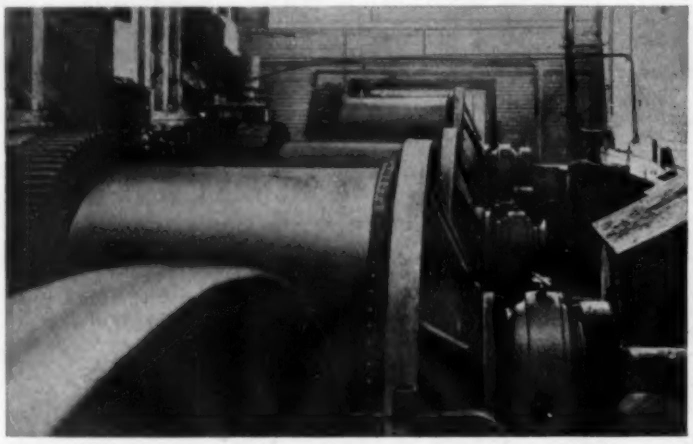
In case any of your readers would have a use for such an extremely pure iron pyrites product, finely ground, we should like to get in touch with them, as our present experience indicates that we could produce such a product at a comparatively small additional cost over our present practice.

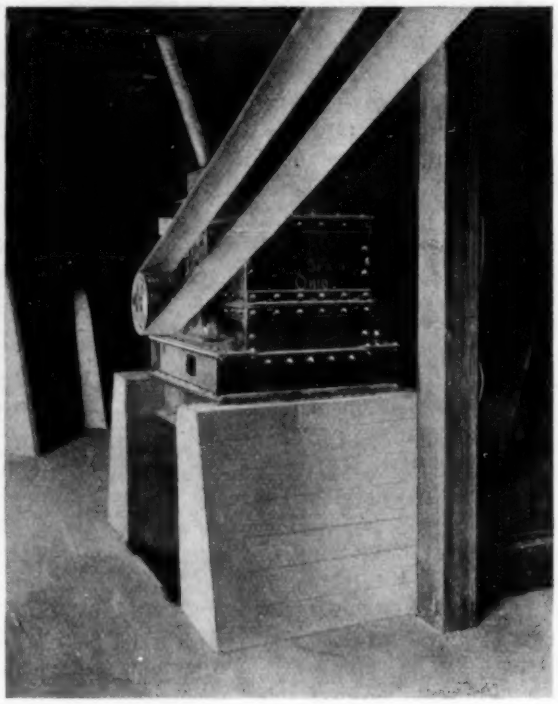
A. H. EUSTIS,
Vice-President, Virginia Smelting Co.

Boston, Mass.

The three ball mills shown in this cut are designed for heavy duty service. The load on each journal is about 18 tons. Through the use of ball bearings the power consumption for each mill was reduced from 80 hp. to 70 hp. when driving at 28 r.p.m. This power is supplied from the motors shown, which drive the mills through reducing gears.

This swing hammer type crusher pulverizes 8 tons of lime per hour. Through the use of a modern belt drive and ball bearings throughout 25 horsepower running the mill at 1,350 r.p.m. amply takes care of the power requirement. Note the slots in the drive pulley that serve to relieve the air cushion under the belt.



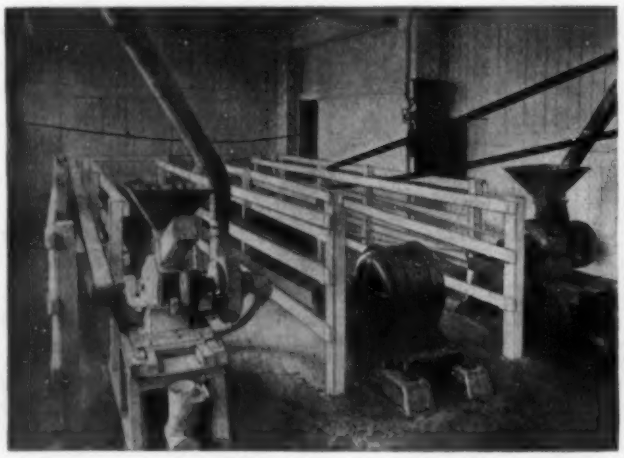


Modern Grinding Mills

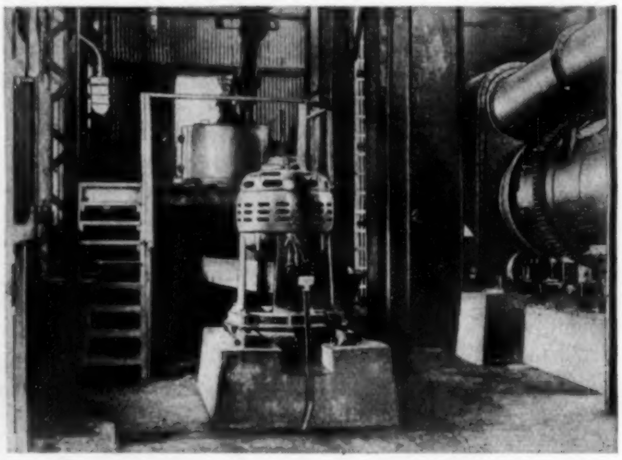
A Design Is Available to Meet Every Need

SPECIAL service demands have called forth special designs, until there is today a sufficient diversity of grinding equipment to fill all needs. Along with this development has gone an improvement of grinding mills considered solely as machines. For instance, great reductions have been made in the power consumption of such machinery through the use of improved bearings of the ball and roller types. Improved drives have also contributed to this end.

The installation photographs shown on this page illustrate the wide variety of mills available and also show some of the methods of installing and operating them.



The modern food products plant frequently needs to pulverize some of its materials. This installation shows two ball-bearing pulverizers in such a plant, driven from a ball-bearing motor. The method of guarding the belt drives with removable rails is a feature of this layout, as is also the general cleanliness of the surroundings.



Pulverized coal is taking an ever more important place as an industrial fuel. This picture illustrates a ball-bearing coal comminuter of a well-known make. It is driven by a vertical ball-bearing motor. The coal drier that removes the moisture prior to the pulverizing appears on the right.

Equipment News
From Maker and User

Gage for Hardness Tester

The F. H. Bultman Co., of Cleveland, Ohio, manufacturer of the Izod Impact Testing Machine, has placed on the market a gaging equipment for inspecting the specimens to be tested on this machine.

A standard specimen for Izod test consists of a bar 10 mm. square, with a 45 deg. notch milled 2 mm. deep. It is important, in order that results of tests be properly comparable, that all specimens have the same area of metal beneath the notch, because this is the area that will be broken in the test that is to be made.

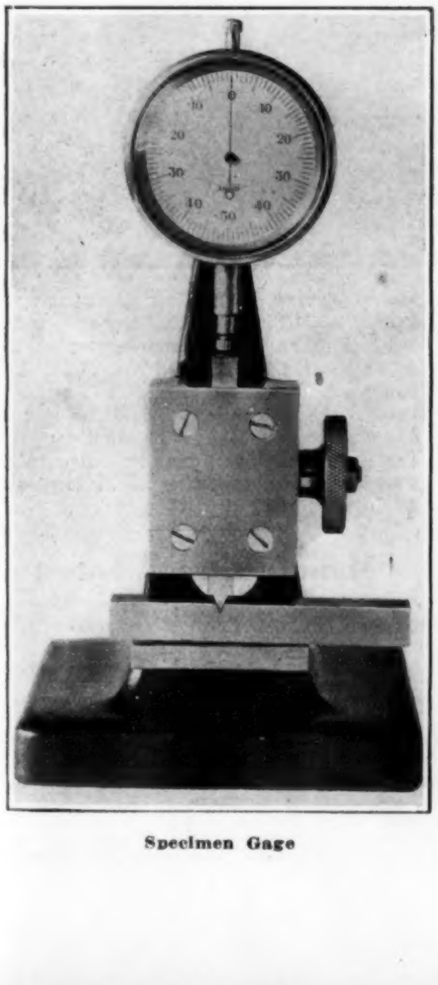
The purpose of this equipment is to facilitate the inspection of these specimens and to insure that their size is maintained to a standard that is similar for all users.

A hardened and ground standard specimen is furnished. All of these standard specimens are made uniform to a single standard.

The gage illustrated is used by first placing the standard specimen on the table of the gage and then taking the dial readings when the "V" bar is brought down on the surface of the specimen and on the bottom of the groove.

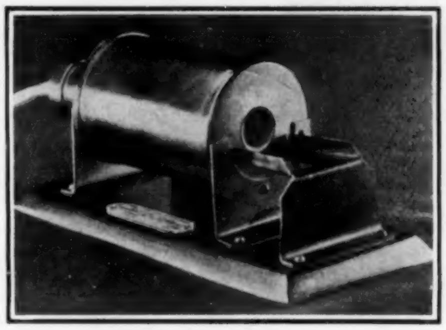
The specimen that is to be inspected is then similarly gaged and the variations in size from the standard noted by the readings of the dial.

A form cutter for milling the notches is furnished with this gage. The complete equipment is mounted in a wood cabinet.



Specimen Gage

Small Electric Furnace



The above cut shows a new small-size electric furnace for laboratory, testing and similar small work, made by the Westinghouse Electric & Manufacturing Co. It is constructed of a 1-in. porcelain muffle, around which is wound the heating element of nickel-chromium wire. The refractory tube is insulated with molded insulation and the whole is protected by a sheet-metal shell. The front is fitted with a support or shelf for the work being treated. Cord and plug attachment for connecting to lamp socket is supplied. Continuous temperatures of 1,600 deg. F. are reached with this furnace, while short time heats can be made at temperatures as high as 1,850 deg. F.

Multiple Temperature Recorder

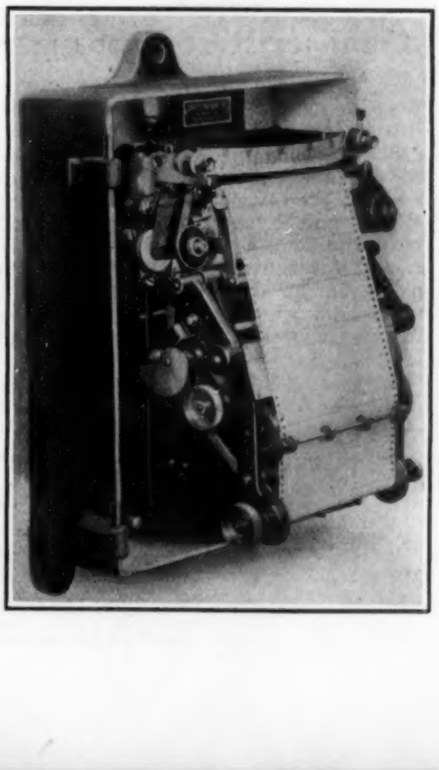
An instrument recently placed on the market for temperature recording in connection with pyrometric processes embodies many interesting features. This device, made by Charles Engelhard, Inc., 30 Church St., New York, is furnished in three types—for single records, for multiple records up to six, but without color distinction between records, and for multiple records up to six, in six different colors.

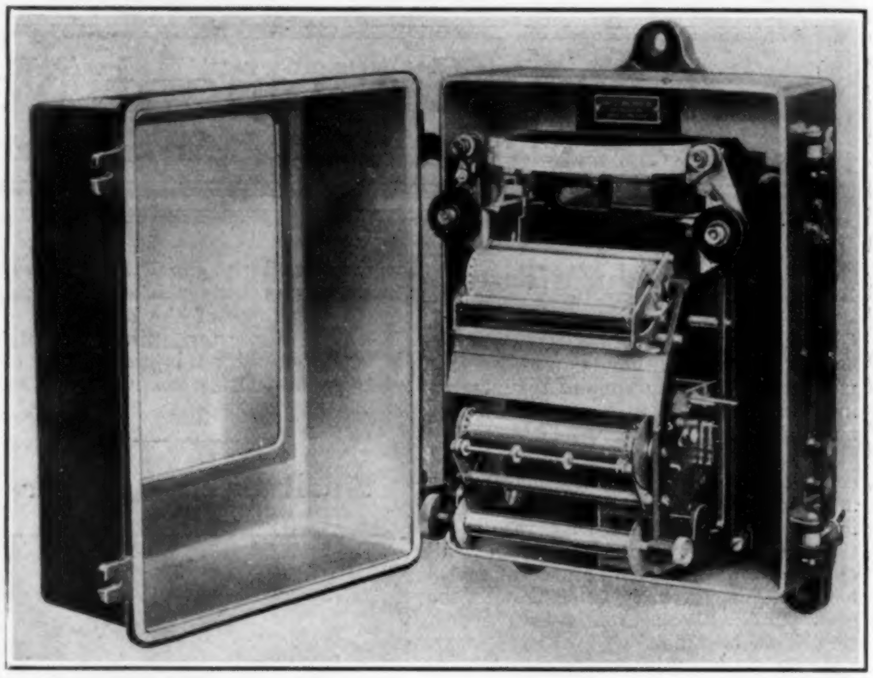
The construction has been made rugged to meet severe plant operating conditions. The indicating scale has an arc length of 6½ in. It is calibrated both in temperatures and in millivolts. The range, etc., depend on conditions to be met. The chart has a calibrated width of 5⅞ in. and is 6⅝ in. wide over all. Charts may be had for rates of movement of ¾ in. and 1½ in. per hour. Chart rolls are 100 ft. long.

The galvanometer used on this instrument is of the well-known Engelhard type. The clock does not operate the mechanism of the recorder, but times the chart and also a contactor, which makes a contact once in 30 or 60 seconds, as needed. The reroll, at the bottom of the instrument, is driven from the electromagnets that operate the other mechanism of the instrument, and exerts sufficient tension to take care of chart operation. At all times 10½ in. of chart is visible, but the length that has been wound on the reroll may be viewed by simply pulling the chart out from the reroll. In such cases it is rewound by hand, a knob for this purpose being provided. Charts may be easily inserted by tipping the

Interior of Temperature Recorder

The case is 16 in. wide and 20 in. high over all, with a depth of 10 in. The cover hinges to the base about 5 in. from the front of the instrument. The back casting is of iron, the cover of aluminum. Both are finished in a hard rubber baked on enamel. A heavy rubber gasket is fitted between base and cover. Wing nuts on swinging studs and heavy hinge studs permit a high pressure between the cover and back casting, insuring freedom from dust within the case. The front is of double thickness plate glass. There is a small glass window in the top of the cover. The inside finish is of aluminum bronze.





Temperature Recorder With Case Open

The record is made on the top of the chart and shows from the front of the instrument as soon as it is made, for the chart starts downward directly at the point when the record is actually formed. A typewriter ribbon of standard size is automatically traversed from one side of the instrument to the other just over the chart paper. The ribbon spools have to be reversed once each 30 days. Over the ribbon and beneath the instrument pointer is a thin silk ribbon that prevents direct contact between the pointer and the inked ribbon. The record is formed by dropping a depressor bar at intervals of either 60 seconds or 30 seconds on to a solid section near the end of the pointer, causing the pointer to press the ribbon against the chart, under which is a slightly rounded bar. The record thus made is a series of small dots.

chart carriage out and away from the pointer.

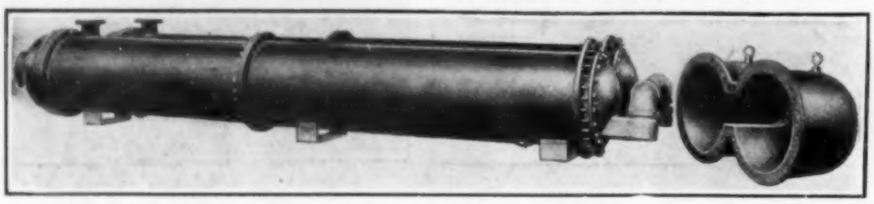
Power for operating is obtained from solenoids mounted behind the mechanism shown in the cuts. Various voltages are furnished to fit various cases. In the multiple record instruments printing all in one color, an automatic switching device is built into the instrument in connection with the solenoid magnet. For multiple records in color a wide ribbon with all the colors is used. The solenoid that operates the automatic switch in this case also controls a cam, which controls the position of the color ribbon. Thus the ribbon is automatically shifted in exact accordance with the rotary switch, so that when switch point No. 1 is connected color No. 1 is in recording position, and so on. In conjunction with this an annunciator is provided near the front of the instrument that shows which point is connected to the recorder at any instant and also the color of the record formed at that point.

Compact Heat Exchanger

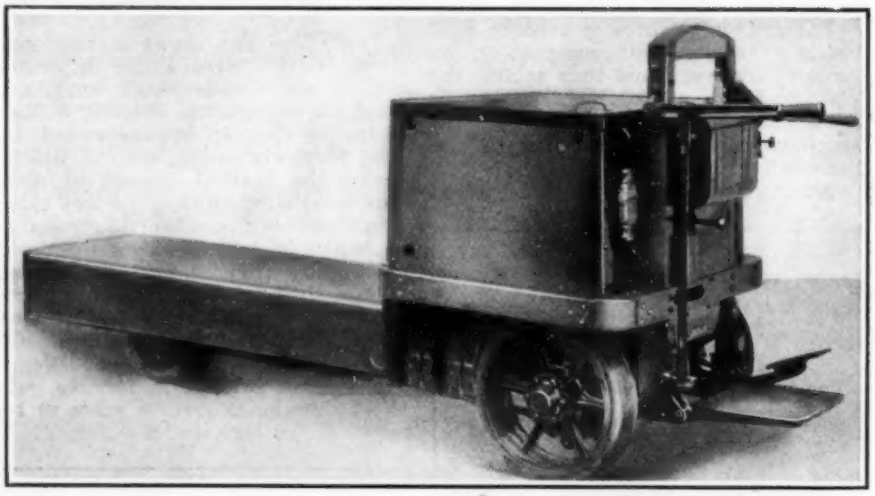
A novel design of heat exchanger for oil refinery use is shown in the illustration below. By using two short exchangers connected by a flexible bend and shell cover, a compact, rugged, readily portable and easily installed unit is obtained, approximately half the length of a single unit designed for equivalent duty. This twin arrangement also divides the tube and shell expansion between two units and makes inspection and cleaning much easier.

In this exchanger, the cooling liquid and the liquid to be heated flow in opposite directions for most efficient exchange of heat. Two styles of baffles are used to guide the liquid around the tubes, the selection depending upon the allowable pressure loss in the shell. All oil connections are at the same end to simplify piping, and floating heads and head covers eliminate strain on tube heads and prevent danger of cracked tube plates.

This device is a product of the Griscom-Russell Co., 90 West St., New York.



Lift Truck



The accompanying photograph shows one of the most recent developments in the electric industrial truck field. It shows an elevating platform or lift truck that has a height of 17½ in. from the floor when the platform is down and 22 in. when the platform is raised. The main feature of this truck, compared with the type that uses a 12-in. lift, is the fact that the rear wheels are 15 in. in diameter, which gives 6-in. clearance underneath the platform. All the tires on this truck are 5 in. in width, and it is constructed for heavy service, with a lifting capacity of 6,000 lb. The wheels are equipped with Timken roller bearings and the driving unit is carried on SKF ball bearings. The controller is built by the Cutler-Hammer Co., and the motors are General Electric. All working parts are accessible and easily adjustable. The loading platform is 70 in. long and 26 in. wide.

Manufacturers' Latest Publications

American Rust Proof Co., 8 West 40th St., New York.—A booklet entitled "Rust and Rust Prevention," describing the use of "Vatu," this company's rust preventive.

Combustion Utilities Corporation, 8 Bridge St., New York.—A catalog of gas-fired furnaces and appliances and gas burners made by this concern and the Surface Combustion Co., a subsidiary.

Gardiner & Lewis, Inc., 30 Church St., New York.—Bulletin 8A. A booklet describing "Krodeproof," an asphaltic material for use as a protection against water and corrosion.

U. S. Patents Issued December 2, 1924

Electrode, Welding Rod and Soldering Stock. Ernest Henry Jones, London, England.—1,517,292.

Receptacle for Blasting Cartridges. Ambrose Kowastch, Berlin-Charlottenburg, Germany.—1,517,294.

Primer for Liquid-Air Cartridges. Ambrose Kowastch, Berlin-Charlottenburg, Germany.—1,517,295.

Electrode for Electric-Arc Welding. Georges Motte, Brussels, Belgium. — 1,517,311.

Wet-Fuel Furnace. Fritz Seyboth, Zwickau, Germany.—1,517,319.

Bath for Galvanizing. Nicholas King Turnbull, Millport, Scotland.—1,517,324.

Apparatus for Vulcanization. Edwin C. Wiese, Milwaukee, Wis., assignor, by mesne assignments, to the Fisk Rubber Co., Chicopee Falls, Mass.—1,517,327.

Process for Improving Metals and Alloys in Resistance to Repeated Stress. Horace W. Gillett, Ithaca, N. Y.—1,517,354.

Moldable Compound. Frank J. Geoten, Jr., Meriden, Conn., assignor to the Connecticut Telephone & Electric Co., Inc., Meriden, Conn.—1,517,360.

Wear-Resisting Chrome-Iron Member. Frederick M. Beckett, New York, N. Y., assignor to Electro Metallurgical Co., New York, N. Y.—1,517,392.

Production of Iron and Steel by Treating Directly Gangue-Freed Ores. Georges Constant and Andre Bruzac, Paris, France. —1,517,402.

Lubricant and Friction Testing Machine. Richard M. Deeley, Kew, England. — 1,517,410.

Tunnel Kiln. Thure Larsson, Worcester, Mass., assignor to Norton Co., Worcester, Mass.—1,517,437.

Means for Preventing Remixing of Separated Liquids. Hans Olof Lindgren, Stockholm, Sweden, assignor, by mesne assignments, to the De Laval Separator Co., New York, N. Y.—1,517,441.

Gas-Analyzing Apparatus. Alexis S. Lomshakoff, Prague, Czechoslovakia. — 1,517,442.

Process of Producing Powdered Meat. John C. MacLachlan, St. Paul, Minn., and John M. MacLachlan, Milwaukee, Wis.— 1,517,445.

Heat Treatment of Manganese Steel. Wesley G. Nichols, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.—1,517,451.

Machine and Method for Making Dry-Pressed Rough Texture Brick. Otto C. Oehler and William Hillerbrand, St. Louis, Mo.—1,517,452.

Food Product and Process of Making Same. Scott H. Perky, Keeseville, N. Y.— 1,517,453.

Combined Tar Extractor and Gas Exhauster. Robert H. Reed, Easton, Pa., assignor to Ingersoll-Rand Co., Jersey City, N. J.—1,517,457.

Steam-Actuated Ejector. Henry F. Schmidt, Swarthmore, Pa., assignor to Westinghouse Electric & Manufacturing Co.—1,517,467.

Process for the Seasoning of Wood. Rolf Thelen, Madison, Wis., dedicated, by mesne assignments, to the Citizens of the United States of America.—1,517,473.

Regulator for Air-Lift Pumps. Lewis C. Bayles, Easton, Pa., and Herbert T. Abrams, Orange, N. J., assignors to Ingersoll-Rand Co., Jersey City, N. J. — 1,517,490.

Juice-Liming Apparatus. Charles J. Fleener, Waipahu, Territory of Hawaii, assignor of one-third to Ernest W. Greene and one-third to W. Richardson, both of Waipahu, Oahu, Territory of Hawaii. — 1,517,499.

Apparatus for Classifying Granular Material. Martin Hokanson, Duluth, Minn.— 1,517,509.

Method of Making Arsenical Salts. Stewart Joseph Lloyd, University, and Absalom Mason Kennedy, Montgomery, Ala.—1,517,516.

Vulcanizer. Ernest W. Melvin, Milwaukee, Wis., assignor to the Fisk Rubber Co., Chicopee Falls, Mass.—1,517,517.

Stiffening Agent for Fibrous Materials. Charles E. Swett, Boston, Mass., assignor of one-half to Harry H. Beckwith, Brookline, Mass.—1,517,520.

Process for Producing Lime-Sulphur Compounds. William H. Volck, Watsonville, Calif.—1,517,522.

Method of and Apparatus for Activating Charcoal. Robert C. Allen, Lakewood, Ohio, assignor to Henry L. Doherty & Co., New York, N. Y.—1,517,523.

Rapid-Reaction Furnace. Oscar L. Barnebey, Detroit, Mich.—1,517,526.

Crushing Mill. Arthur C. Daman, Denver, Colo.—1,517,538.

Method of Activating Carbon. Frank M. Dorsey, Cleveland, Ohio, assignor to General Electric Co.—1,517,543.

Vulcanizing Apparatus. Daniel Edward Hennessy, Milwaukee, Wis., assignor by mesne assignments, to the Fisk Rubber Co., Chicopee Falls, Mass.—1,517,560.

Pulverizing Machine. Sahn K. Lowe, San Francisco, Calif.—1,517,564.

Lubricant. Zacharias Olsson, New York, N. Y.—1,517,577.

Process of Dyeing. Paul Rabe, Leverkusen, near Cologne-on-the-Rhine, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.—1,517,581.

High-Pressure Piston. Thomas B. Slate, Elmhurst, N. Y., assignor, by mesne assignments, to Prest-Air Corporation, New York, N. Y.—1,517,593.

Apparatus for Spraying Fluids and Mixing the Same. John William Stevenson, Ebbw Vale, England.—1,517,598.

Coating Fabric with Rubber. Edwin C. Wiese, Milwaukee, Wis., assignor, by mesne assignments, to the Fisk Rubber Co., Chicopee Falls, Mass.—1,517,606.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers. Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Enamel Composition. Hugh S. Cooper, Cleveland, Ohio, assignor to Kemet Laboratories Co., Inc.—1,517,618.

Artificial Silk and Process of Making Same. Emil Hubert, Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.—1,517,627.

Anode for Use in Electroplating. Giraldus Jones, Birmingham, England. — 1,517,630 and 1,517,631.

Method of Treating Substances Used in Fermenting Industry. Eduard Moufang, Kirn-on-the-Nahe, Germany, assignor to the Corporation of Nathan-Institut Aktiengesellschaft, Zurich, Switzerland.—1,517,650.

Producing Aluminum Fluoride-Alkali-Metal Fluoride Double Compounds Practically Free From Iron. Heinrich Specketer, Griesheim-on-the-Main, Julius Soll, Schwanheim-on-the-Main, and Robert Bilfinger, Griesheim-on-the-Main, Germany, assignors to the Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. — 1,517,686.

Manufacture of Fertilizer by Treating Phosphates With Nitric Acid. Gustav Adolf Voerkelius, Biebrich-on-the-Rhine, Germany.—1,517,687.

Process for the Recovery of Metallic Values From Slag. Harry V. Welch, Los Angeles, Calif., assignor to International Precipitation Co., Los Angeles, Calif. — 1,517,689.

Electrode for the Oxidation of Nitrogen. Birger Fjeld Halvorsen, Christiania, Norway, assignor to Norsk Hydroelektrisk Kvaelstofaktieselskab, Christiania, Norway. —1,517,727.

Method of Drying Solid Combustible Material. Thomas Rigby, London, England.—1,517,755.

Apparatus for Extracting Fat. Bernard C. Sell and James M. Spring, Norfolk, Va. —1,517,763.

Manufacture of Sugar Products. James Leslie Fairrie, Liverpool, England. — 1,517,775.

Attachment for Beating Engines. John Lawrence Harris, Thomson, N. Y. — 1,517,783.

Valve for Ascension Pipes and the Like. Thomas G. Kus, Winnetka, Ill., assignor to American Coke & Chemical Co., Chicago, Ill.—1,517,786.

Method of Producing Carbon Electrodes and the Product Thereof. Hans Beer, Ratibor, Upper Silesia, Germany, assignor to Rutgerswerke Aktiengesellschaft, Abteilung Planiawerke, Berlin, Germany.—1,517,819.

Process of Lining Furnaces, Converters and the Like. Eduard Bong, Suchteln, Germany.—1,517,820.

Carbonaceous Fuel. Gustav Egloff and Harry P. Benner, Chicago, Ill., assignors to Universal Oil Products Co., Chicago, Ill., a Corporation of South Dakota. — 1,517,830.

Paper-Pulp-Digester Strainer. Carl Jentz, Cap de la Madeleine, Quebec, Canada. —1,517,839.

Automatic Air Controller for Pressure Tanks. Herman H. Kunze, Marissa, Ill.— 1,517,842.

Mold. George L. Mather, Milwaukee, Wis., assignor, by mesne assignments, to the Fisk Rubber Co., Chicopee Falls, Mass. —1,517,850.

Roofing Product and Process for Making Same. Chester E. Rahr and Robert T. Pollock, Boston, Mass., assignors to the Flintkote Co.—1,517,860.

Method and Apparatus for Forming Paper Articles. Labron B. Ross, Hamilton, Ohio.—1,517,862.

Production of Synthetic Ammonia. Stephen L. Tingley, New York, N. Y. — 1,517,870.

Process of Treating Fabrics for Removing Sizing or Gum Therefrom. Maurice Ernest Bouvier, Lyon, France, assignor to Société pour la Fabrication de la Soie Rhodiaseta, Paris, France.—1,517,888.

Muffle Leer. Alvie C. Crimmel, Hartford, City, Ind.—1,517,890.

Powdered Sodium Silicate and Process of Preparing the Same. Walter H. Dickerson, East Orange, N. J., assignor to Industrial Waste Products Corporation, Dover, Del.— 1,517,891.

Leather Substitute and Method of Making the Same. Kenneth R. Douglass, Wilmington, Del., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del. — 1,517,892.

Pump for Liquids at High Temperatures. Sebastien Otto Alfred Fiedler, Paris, France, assignor to l'Auxiliaire des Chemins de Fer et de l'Industrie, Paris, France. — 1,517,898.

Air Separator. Rupert M. Gay, Hanover Township, Morris County, N. J.—1,517,900.

Plant for Electroplating Metal. Felix Kirschner, Vienna, Austria.—1,517,910.

Electric Furnace. Theodore B. Bethtel, Philadelphia, Pa., assignor to F. J. Ryan & Co., Philadelphia, Pa.—1,517,938.

Cracking and Oxidizing Petroleum Oil to Make Gasoline and Useful Products of Oxidation. Carleton Ellis, Montclair, N. J. —1,517,968.

Apparatus for Charging Furnaces of Gas Retorts and the Like. Ralph E. Gibson and Herbert Nicoll, Liverpool, England.— 1,517,977.

Paper-Coating Materials and Process of Making. William J. Lawrence, Kalamazoo, Mich.—1,517,996.

Manufacture of Phosphorus, etc. Richard C. Tolman, Washington, D. C.—1,518,019.

Process for the Preparation of Sulphuric Anhydride by Contact by Means of Vanadium Salts. Paul Audianne and Gabriel Bachalard, Paris, France, assignors to Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Reunies, Establissements Kuhlmann, Paris, France.—1,518,043.

Manufacture of Dyestuffs of the Anthraquinone Series. Arthur Gilbert Dandridge and John Thomas, Carlisle, England, assignors to Scottish Dyes, Ltd., Carlisle, Cumberland, England.—1,518,051.

Production of Bone Black. William Jones, New York, N. Y., assignor to Vesta M. Jones, New York, N. Y.—1,518,072.

Process of Eliminating Carbon From Carbon-Containing Metals. Hugo Lohmann, Berlin-Johannisthal, Germany.—1,518,083.

Suction Box for Paper Machines and the Like. Max Wenzel, Muldenstein, Kreis Bitterfeld, Germany.—1,518,116.

Process of Converting Massive and Other Forms of Sulphur Into Finely Divided Flowers of Sulphur. Charles J. Reed, San Mateo, Calif., assignor of one-half to Alice A. Hall, San Francisco, Calif.—1,518,126.

News of the Industry

Summary of the Week

Muscle Shoals bill still topic of debate in Senate. Underwood proposal, with amendments, gains in favor. Vote expected at any time and predictions are that it will be favorable. Substitute bill for joint Senate and House investigating committee introduced.

Dr. B. D. Saklatwalla, receiving the Grasselli medal, stresses need for "fundamentalism" in ferrous metallurgy.

Annual report of General Fries outlines work that has been done by the Chemical Warfare Service.

Import statistics for November include color strength ratios between paste and powder vat dyes.

The Tariff Commission has completed inquiry into production costs of various vegetable oils.

Attempts to reach an agreement on amendments to the Cramton bill have failed.

The press in Germany intimates that another Anglo-German dye pact may be drafted.

Imports of dyes in November, while large, were below the totals reported for October.

Early Vote Expected in Senate on Muscle Shoals Bill

Leaders of Both Parties Predict That the Underwood Measure Will Pass—Senator Wadsworth Characterizes Government Operation Hopeless for Efficient Management

DISCUSSION in the United States Senate on the Muscle Shoals question consumed the greater part of the time of the sessions during the past week, with many interruptions, however, for the consideration of other matters. The leaders planned to bring the subject to a vote as soon as possible, and as this is being printed it is likely that the vote will be taken.

Both Democratic and Republican leaders predicted that the bill would pass. A number of Senators are anxious to dispose of the Muscle Shoals issue to give early consideration to the Isle of Pines treaty and other important legislation.

Senator Copeland, Democrat, of New York, declared he would vote against any measure that did not require the government to fix the rates on power produced at Muscle Shoals. He urged the Senate not to take hasty action and declared legislation could be enacted 2 years hence without harmful effects.

Brookhart Against Private Control

Senator Brookhart, insurgent Republican, Iowa, said he stood ready to convert the nitrate plants into fertilizer factories, but opposed turning over the power to private interests, who could exploit the property to the disadvantage of the people. If private interests obtained the Muscle Shoals power, he declared, the farmers would get no more benefit than the farmers of Iowa have obtained from the Keokuk Dam.

Senator Howell, Republican, Nebraska, asserted the Senate should take warning from the lease of the navy oil lands and not accept a contract carrying "loopholes." The bill should state specifically, he said, what a lessee would be required to do.

It was apparent early in the discussion that the withdrawal of the Ford offer was taken seriously. Apparently no one has any thought that he can be induced to renew it.

Norris Praises Research Laboratory

Referring to the work of the Fixed Nitrogen Research Laboratory, Senator Norris pointed out to the Senate that every witness commended the work done by Dr. F. G. Cottrell and his staff. "It is gratifying to know," he declared, "that our own government officials have taken the lead in the country, and perhaps in the world, in bringing about improved methods of extracting nitrogen from the air. Notwithstanding their accomplishments, processes have not reached the point where the cost of fertilizer can be very much reduced." In the judgment of the committee, Senator Norris pointed out, the nitrate plants should be placed at the disposal of the chemists of the Agricultural Department, so that they may continue their experiments. Thus Muscle Shoals, he asserted, could be made the greatest center in the world for the large-scale study of fertilizer problems.

"We believe from our investigations," Senator Norris said, "that it is not possible to produce the ingredients of fertilizer at Nitrate Plant No. 2 by the method installed in that plant at a price that will reduce the cost of fertilizer to the farmer."

Senator Norris urged that power and fertilizer be handled separately. He also pointed out that there is going to be a large surplus of power over the maximum needs of fertilizer manufacture. In advocating public operation of the entire Muscle Shoals enterprise, Senator Norris explained that he wants to do nothing that is not in the interest of the people as a whole. None in the Senate doubts his sincerity and there is general commendation for the manner in which he conducted the Muscle Shoals investigation.

Underwood Explains His Proposal

Senator Underwood, in explaining the proposition which he proposes to substitute for the committee bill, declared that he is "not contending that it is unwise that electric power be massed and that industry should get the benefit of it. Too much water runs down the streams of America that is not harnessed, but we have made a dedication of this project to patriotism, to the life of the nation, to the power of the government, and to the upbuilding of the toiling masses of American people who are engaged in agricultural endeavor." He characterized the committee's substitute for the Ford offer as a power bill and his own substitute as a national defense-fertilizer bill. He called attention to the fact that 1,607,000 tons of nitrogen had to be rushed to this country from Chile during the war. He is not impressed with the possibilities of the expansion of the by-product coke industry to the point where it will supply the country's nitro-

gen needs. He expects most of the byproduct ammonia to continue to be used for refrigeration. Forty thousand tons of fixed nitrogen is equal to 250,000 tons of Chilean saltpeter, he pointed out to the Senators. "In the last 25 years," he said, "we have paid a fertilizer bill to Chile of a billion dollars. Every bit of fertilizer that comes out of Chile is taxed at the rate of $12.53 a ton. We have paid to Chile in taxes more than $200,000,000. Why should we continue to do that? Germany is not doing it. Germany is making her nitrogen out of the air."

Senator Underwood characterized the committee bill as a theoretical proposition and primarily a power bill. "The substitute that I have offered," he explained, "is to lease it under the binding terms that were in the Ford offer as to nitrogen and fertilizer, if we can get a lessee. If we cannot do it by July 1, it provides for the creation of a government corporation. The President is to select the five directors and the government corporation is to run the plant under the terms of the Ford offer."

Joint Investigating Committee Proposed

The proposal to refer the matter to a joint committee of Congress took legislative form in a concurrent resolution offered by Representative Kearns. This bill provides that the joint committee be composed of three members of the Senate Committee on Agriculture and three members of the House Committee on Military Affairs. The committee is "to investigate and report to Congress, as speedily as possible, a feasible plan for the utilization of the properties of the United States at Muscle Shoals, in such a manner as to insure adequate production of fixed nitrogen for use in national defense, the encouragement of commercial development and manufacture of nitrogenous fertilizer products for the benefit of agriculture, the most beneficial use of surplus power not required for nitrogen production, and an adequate return to the government for its investment in power plants."

The bill provides that the joint committee is to examine the offers already made and to invite additional bids, if it should be deemed advisable. It is authorized to conduct such negotiations as may be necessary to enable the committee to recommend to Congress the most satisfactory method of dealing with the property and requirements. It contains the significant suggestion that the committee may report separate plans for the utilization of the nitrate production facilities and the surplus power.

Wadsworth Against Government Operation

Senator Wadsworth of New York declared that he is utterally opposed to the government going into commercial business. He pointed out that the amendment proposed by Senator Bruce of Maryland, proposing that all employees that the government might engage at Muscle Shoals should be chosen under Civil Service regulations and providing penalties for the exercise of political influence in their selection, reveals "the whole vice of government operation." He called attention to the fact that the government is confronted with two alternatives. Either the men who are put in charge of the undertaking are to be given entire freedom in the exercise of their abilities, or they are to be restricted by statute in an effort to prevent the injection of politics into the effort itself.

"Just so long," continued the New York Senator, "as we have before us any measure proposing to put the federal government into commercial business we shall be confronted with a dilemma. I do not know which is the worse alternative. Each is bad. If there are no restrictions, nine-tenths of the members of this body will be importuned by constituents for jobs under the government corporation. If we impose restrictions and subject the whole thing to Civil Service rules, the management of the corporation will have lost that most valuable privilege that should inure to every man who is to be responsible for the success of a business undertaking—the right to hire and fire. If we are committed to government operation, I shall join in setting up every conceivable safeguard against its dangers. It is going to be a long uphill fight. Such a fight never has been won in the history of governments up to this hour. The whole thing is hopeless in the matter of efficient management."

Senator Wadsworth emphasized the point that no private interest would come forward to undertake the enterprise with the mandatory provision for an annual production of 40,000 tons of nitrogen. He pointed out that the development of processes had reduced the amount of power that is necessary. He argued for the support of the fertilizer experiment with the proceeds from the sale of power. He urged that the legislation be altered so as to be attractive to private operation. Senator Underwood also expressed a preference for private operation, but sees no insurmountable difficulties in handling the project by government corporation. Senator Wadsworth, however, was sure that the chemical part of the undertaking would be coming back to Congress for substantial appropriations to make up its deficits.

C.W.S. Seeks Budget Increase for Boll Weevil Work

While the budget carries nearly $200,000 more for the Chemical Warfare Service than was appropriated for the current fiscal year, General Fries points out that this additional amount is absorbed by the salary increases under the reclassification act. In fact, the Service is allowed $25,000 less for its research and other work, since the budget does not provide for a continuance of the boll weevil work.

It is practically certain that the $25,000 will be provided for when the Chemical Warfare Service items come before Congress. The feeling on Capitol Hill is that the $25,000 being expended this year in experiments with poisons that may be used in connection with weevil control would be practically thrown away unless the experiments can be worked through to their conclusion.

Organic Chemical Industry Hits Its Stride

During the past year constant improvement in the quality of domestic dyes and organic chemicals and steadily lowered prices have given the American consumer of these products greater value for his money than exists in any other country of the world. This Dr. Charles H. Herty, re-elected president of the Synthetic Organic Chemical Manufacturers Association, told to the annual meeting of the association held in New York, Dec. 12. Others to review the year's progress were Francis P. Garvan, president of the Chemical Foundation and honorary member of the association, F. J. H. Kracke, appraiser of the port of New York, and H. C. Meserve, secretary of the National Association of Cotton Manufacturers.

Preceding the talk by Mr. Garvan at the annual luncheon Dr. Herty introduced three newly elected honorary members: Franklin W. Hobbs of Arlington Mills, Henry B. Thompson of the United States Finishing Co. and Frank D. Cheney of Cheney Bros., all of whom are representative and enthusiastic consumers of American dyes. A new feature of this annual meeting was the informal conference with many of the leading professors of organic chemistry, among them being Bogert of Columbia, Treat B. Johnson of Yale, Lauder Jones of Princeton, Norris of M.I.T., Conant of Harvard, Reid of Johns Hopkins and Edgar F. Smith of Pennsylvania. Another distinguished guest of the association was Sir William Alexander, formerly the head of the British Dyestuff Corporation.

"Fundamentalism" in Metallurgy Needed, Says Saklatwalla

About 100 persons attended the regular dinner and meeting of the American Section of the Society of Chemical Industry at the Chemists Club, New York, on Dec. 5, when the Grasselli medal was presented to Dr. B. D. Saklatwalla of the Vanadium Corporation of America. F. M. Turner, Jr., a former associate of the medalist, gave a brief biographical sketch, and Dr. William H. Nichols made the presentation address.

Dr. Saklatwalla was born in Bombay, India, in 1881 and received his bachelor's degree from the University of Bombay in 1901. He then studied in Germany, receiving the degree of Eng.D. from the Royal Polytechnicum, Charlottenburg, in 1908. In the same year he was awarded the Carnegie medal of the Iron and Steel Institute of Great Britain for his work on the compounds of phosphorus in iron. About 1910 he came to the United States, and his research and development work on the metallurgy of vanadium during the succeeding 5 or 6 years were largely responsible for the creation of the vanadium steel industry of today.

In his address of acceptance Dr. Saklatwalla said that the greatest need of the ferrous metallurgical industry was for "fundamentalism." Future research in metallurgy must be based on the concept of equilibrium, he said.

Washington News

Tariff Hearing for Vegetable Oils May Be Set for February

The domestic field work of the Tariff Commission in connection with its inquiry into costs of producing various vegetable oils for which applications for reduction in duty under the flexible tariff have been filed has been practically completed and the data are being tabulated. The European investigations also have been completed and these data also are being calculated. The investigators who have been working in the Orient and the East Indies are expected to land about Dec. 20. Upon their return to Washington the Chemical Division will push its tabulations so that the commission may be in a position, probably early in February, to fix a date for final hearing in this case.

German Press Comment on Dye Pact With British Interests

In a report to the Department of Commerce, W. T. Daugherty, trade commissioner at Berlin, quotes extracts from the German press relative to the recently proposed dye agreement between German and British interests. The *Deutsche Bergwerks Zeitung* of Essen stated the reasons that the English Government objected to an agreement between the I. G. and the British Dyestuffs Corporation are because German chemists, who evolved dyestuffs intermediates during the war, not only gave great stimulus to dyes production but thus contributed to the production of high-powered explosives. In so far as dyes production goes hand in hand with that of explosives and poisonous gases, etc., the Dyestuffs Corporation was formed in England after the war, with state help, to give England an instrument to supply it with war materials in case of war, as well as to cover needs of its textile industry in time of peace. The business administration, however, worked without sufficient scientific backing, so that losses and failure to declare dividends were the result. After an existence of 3½ years, the B.D.C. was convinced that a community of interests with the highly developed German industry would be welcome. This was disapproved by the English Government, and at the same time the Dawes conference in London required German deliveries of reparations dyes to be continued 3½ years after their peace treaty limit, Jan. 10, 1925.

Die Metallboerse of Berlin printed correspondence intimating that another Anglo-German dye pact may be drafted to replace the one already vetoed by the British Government:

"The (British) Government, through Commerce Minister Sydney Webb, replied in writing to an inquiry addressed to it: 'The Administrative Council of the British Dyestuffs Corporation has been informed that the government was obliged to exercise its veto right on the proposed agreement with the (German) I. G.'

"This answer, however, offers another alternative course, according to our opinion. The British Government, to be exact, has only repudiated the agreement in its present form. It might not discredit another treaty that would be acceptable to it. That which apparently disquiets the English Government is that such a community would give the British Dyestuffs corporation a sales monopoly in England, the monopolistic price development smoothing the way to this."

Fries Reports Progress by the Chemical Warfare Service

In his annual report of the Chemical Warfare Service for the fiscal year 1924, General Amos A. Fries says that the outstanding accomplishment of the year has been the development of a curtain smoke screen that is particularly effective when laid by aircraft. The screen of dense white smoke is formed by the hydrolysis of titanium tetrachloride sprayed from special nozzles. Other important results include the work on the dispersion of smoke by marine stack gases, the further application of posphorus as a screening and incendiary agent, and an improved design of facepiece for the service gas mask.

Of the total appropriation of $700,000, about $172,000 was spent for research and development. Much of this research is of general public interest; for example, the fight against the cotton boll weevil, the application of chlorine to the treatment of colds, and a study of the extermination of marine borers.

Americans Watching Experiments on Charcoal Gas as Fuel

American interests are following closely the experiments being made in England and in France in the use of charcoal gas as a fuel for internal combustion engines. The matter also is receiving attention from the Central Committee on Utilization of Forest Products, set up at the recent forest products conference. If producer gas can be used in internal combustion engines with an important saving as compared with gasoline, in England and France, it is believed a comparable saving could be made in this country, where charcoal can be produced at low cost from lumber waste.

Color Strength Ratios Given in Statistics of Dye Imports

In the monthly report on imports of coal-tar dyes for November, the Chemical Division of the Department of Commerce in co-operation with the Chemical Division of the Tariff Commission, appended a list of vat dyes with the color strength ratios between paste and powder. Importations in the monthly lists are calculated on single strength. This is the first time the ratios have been published in this form, and the supplement will prove valuable to both importers and domestic producers. The list of ratios will not be published regularly, so that the copy of the November report should be preserved by those desiring to refer to this information.

Annual Report Outlines Problems Before Bureau of Chemistry

The enormous losses resulting from the deterioration of fruits, vegetables, grain, sugars, sirups and other foods is one of the most pressing economic problems before the agricultural chemist today, says Dr. C. A. Browne, chief of the Bureau of Chemistry, in his annual report made public last week. The Bureau of Chemistry is giving much attention to this conservation work along with various other problems discussed in the report.

Among other investigations being carried on by the department chemists are problems of the value of different kinds of protein for animals and humans, the odors of plants as factors in insect control, the utilization of vegetable oils, processing of fruits and vegetables for meeting various transportation and market conditions, methods of making certain kinds of sugar, processes for tanning, treatment of such fabrics as canvas to make them more fire and water resistant, dust explosions and fires, and insecticides and fungicides. Contributions have been made to the chemical development of the dye industry, and improvements have been made in rosin and turpentine processes.

Sesame Classed as a Chemical

The Treasury Department has ruled that sesame may be considered a chemical within the meaning of paragraph 1514 of the tariff act and that cast-iron or steel drums in which sesame is shipped abroad are entitled to free entry when returned to the United States under the provisions of that paragraph and the regulations of the department.

Citation Against Allied Chemical & Dye Corporation

The Allied Chemical & Dye Corporation, of New York City, has been cited by the Federal Trade Commission for alleged violation of certain provisions of the Clayton act. The commission's complaint is based on the allegation that the respondent corporation acquired the stock or share capital of the following named corporations: The Barrett Co.; the General Chemical Co.; the Solvay Process Co.; the Semet-Solvay Co.; and the National Aniline & Chemical Co., Inc.

The complaint states that the effect of respondent's acquisition of the stock of these companies is substantially to lessen competition among such corporations, to restrain commerce in various articles, products and chemicals produced by these corporations and to tend to create in the respondent a monopoly in various lines of commerce in which the corporations were respectively engaged, especially in the chemicals and coal-tar products required in the production of dyes and dyestuffs.

News in Brief

Southern Exposition Postponed to May—William G. Sirrine, president of the Southern Exposition, has issued a written statement definitely fixing the dates for the holding of the exposition in the Grand Central Palace as May 11 to 23. The postponement from January to May was made necessary by reason of the fact that a number of states could not complete their arrangements in time to make displays.

University of Chicago to Spend $17,-500,000 for New Buildings—In connection with a 1925 construction program, the board of trustees, University of Chicago, plans the erection of a four-story chemical laboratory, estimated to cost approximately $800,000. It is purposed to proceed with the work as soon as the disposition of a gross fund of $17,500,000, for new buildings is definitely arranged.

Studying Production of Oil From Shale Fields — The means for future production of oil from government reserves of coal and oil shale is the subject of a conference being held at the Interior Department by technologists of the navy, the Bureau of Mines and the Geological Survey. A research program to aid commercial development of processes by which oil may be obtained from oil shales, lignite and other coal is being planned by the Bureau of Mines. A report was made upon recent research in foreign countries by A. C. Fieldner, superintendent of the Pittsburgh experiment station, who has just returned from a trip of inspection through European laboratories and carbonization plants. Reports were also rendered upon recent research in the fuels and petroleum laboratories of the Bureau of Mines.

Chilean Nitrate Companies Merge—The Lautaro Nitrate Co., Ltd., through the purchase of the Lastenia interests, has become the largest single concern engaged in production of nitrate of soda in Chile. The output of the Lautaro company is 15 per cent of the country's total production.

Phillips Petroleum Co. Spends $4,000,-000 for Expansion—The Philips Petroleum Co., Bartlesville, Okla., is concluding an expansion program for which a fund of $4,000,000 has been invested, including the purchase of refineries, oil and gas properties and machinery. The company is now said to be the largest producer of natural gasoline in the United States, with a total rated output of 300,000 gal. per day. A primary feature of the expansion has been the acquisition of the plant and properties of the Landreth Gasoline Co., the largest in Texas, located in Shackelford County, including gas rights in the Ibez district, with its subsidiaries, the Landreth Production Co. and the Landreth Gas Co. Other extensions were for the most part in Oklahoma.

No Agreement in Senate on Cramton Bill

Measure Is Still on Senate Calendar and No Vote Probable Until After Jan. 1

Several efforts to reach an agreement on amendments to the Cramton Prohibition Bureau bill have failed utterly. As this is written, the Anti-Saloon League is insisting that the bill be kept on the Senate calendar. Indications are that the opponents of the bill do not have the votes necessary to force its return to the Judiciary Committee for further hearings or committee consideration.

It was the plan of the opponents of the bill at the opening of the session to move to recommit the measure at the first opportunity. Senator Sterling, in charge of the legislation, showed a decidedly conciliatory attitude and let it be understood that he would accept any "reasonable" amendment to the House bill. In line with the Taft suggestion, it was proposed that the bill be amended so as to allow the Prohibition Commissioner to obtain immediate control of industrial alcohol production and distribution, but with the proviso that appeals could be taken to a board on which the Department of Justice was to be represented. This was rejected by the supporters of the measure. Later it was proposed that the Board of Appeals consist of a representative of the Treasury Department, the Department of Justice and of the Department of Commerce. The Anti-Saloon League, and most of those favoring the bill follow the lead of that organization, has refused absolutely to accept the Board of Appeals so constituted. That organization insists that if there is a Board of Appeals that it be composed of three representatives of the Treasury Department only.

To the long list of organizations opposing the Cramton bill has been added American Engineering Council. The Council is entirely a disinterested body and its board undertook to oppose the Cramton bill only after a study of the situation that convinced its members that a few misguided zealots are attempting to hamper industrial development in scientific progress in the hope that there may be incidental reduction in the illegal use of some industrial alcohol.

It seems probable, as this is written, that a vote on the Cramton bill cannot be reached until after Jan. 1.

Tire Production in Akron at High Mark

The manufacture of automobile tires in the Akron, Ohio, district is now running on a basis of about 90,000 casings per day, or approximately 10 per cent less than the rate maintained up to the middle of October. It is said that the present operating schedules will be continued at the different mills for an indefinite period. According to figures compiled by the Akron Chamber of Commerce, tire and rubber products to the value of $364,552,564 were manufactured by the twenty-five plants in this district for the year ended Nov. 1. This compares with an aggregate valuation of output of $334,861,000 for a year ago and is greater than any year since the boom production of 1919-20. The annual payroll in the local rubber industry totaled $70,107,554 for the past year, with a gross employment of 42,146 factory workers. These figures, also, exceed the corresponding totals of the past 3 years.

U. S. Civil Service Examination for Petroleum Technologist

The U. S. Civil Service Commission announces an open competitive examination for associate technologist (petroleum production) to fill a vacancy in the Bureau of Mines for duty in Dallas, Tex., and vacancies in positions requiring similar qualifications, at an entrance salary of $3,000 a year. Advancement in pay may be made without changes in assignment up to $3,600 a year. Applications must be received by Jan. 20.

The duties of the position are the conducting of engineering studies in investigations and problems concerning the production and conservation of oil and gas, and the supervision of drilling operations on government and Indian lands.

Competitors will not be required to report for examination at any place, but will be rated on their education, experience and fitness; and writings to be filed with the application.

Full information and application blanks may be obtained from the U. S. Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the post office or custom house in any city.

New York Academy of Sciences to Have Annual Dinner

The annual dinner of the New York Academy of Sciences and its affiliated societies will be held at the Waldorf-Astoria on Dec. 15 at 7 p.m. The dinner will be followed by the annual meeting to receive reports and elect officers and fellows for the year 1925. Dr. Clyde Fisher of the American Museum of Natural History will speak.

French Use Fish to Supplement Sewage Purification

Fish are being used at Strasbourg, France, to supplement mechanical means of sewage purification. After all solid matter has been removed, the sewage is run into storage tanks stocked with carp, pike, trout and other fish. Not only is purification obtained but vast numbers of fish thrive remarkably and are sold for more than the cost of the operation.

Wembley Show to Continue

The British Empire Exhibition at Wembley will be continued another year, and the existing board, with the addition of the Duke of Devonshire, will be authorized to take the necessary steps for its continuance, according to a resolution of the council at the exhibition.

Trade Notes

E. V. Peters, general sales manager of the New Jersey Zinc Co., returned last week from Europe.

A report from Italy says that the price of citrate of lime has been ordered reduced 12½ per cent as of Dec. 1. The new price is 460 lire per 100 kilos.

Canadian Fabrikoid, Ltd., the Dominion Cartridge Co., Ltd., and the Flint Varnish & Color Works of Canada, Ltd., have been registered in British Columbia as extra-provincial companies, and all will at once commence the establishment of branch plants at Vancouver to supply western Canadian trade.

Williams Haynes, chairman of the publicity committee of the Chemical Salesmen's Association, has notified the members that the Christmas party will be held at the Builders Exchange, New York City, on Monday evening, Dec. 22.

The Insecticide and Disinfectant Manufacturers Association will open its eleventh annual convention at the Hotel Astor, New York, today.

The dyestuffs department of E. I. du Pont de Nemours & Co. has announced the development and placing on the market of two new domestic colors. One is a vat color known as Sulfanthrene Orange R Paste and is similar in shades and properties to a color previously imported and known as Hydron Orange R. The other is Sulfanthrene Scarlet BB Paste, which is similar in shade and properties to a color previously imported known as Hydron Scarlet BB.

Sacramento Valley Sugar Co. to Reopen Mill

The Sacramento Valley Sugar Co. is perfecting plans for the resumption of operations at its plant at Hamilton City, Calif., one of the largest mills of its kind on the Pacific Coast. It has been shut down for the past 6 years. The plant is fully equipped, and with necessary repairs will be placed on a day and night basis throughout the season, giving employment to about 300 operatives. Beet sugar growers controlling about 6,000 acres of land in the Sutter Basin section and other points in northern California have agreed to furnish the mill with beets.

Ink Specifications Adopted

The Federal Specifications Board on Dec. 6 adopted two new ink specifications. One of these covers black waterproof drawing ink (specifications 265) and the other indelible marking ink for fabrics (specifications 266). Copies of the specifications are obtainable from the office of the Federal Specifications Board at the National Bureau of Standards, Washington, D. C.

The black waterproof drawing ink is required to be an aqueous suspension of carbon black, for which settling, drying, opacity and fading tests are prescribed. Several chemical tests are provided for determining the suitability of the marking ink.

Decline in Import of Dyes in November

The imports of coal-tar dyes for November, 1924, through the port of New York totaled 359,260 lb., with an invoice value of $351,887. Imports of dyes through other ports are as follows:

	Lb.	Value
Boston	10,850	$10,163
Providence	8,294	7,741
St. Louis	125	89
Detroit	25	71

The total imports of dyes reported from five ports in the United States for the month of November was 378,554 lb., with an invoice value of $369,951.

DYES REMAINING IN BONDED CUSTOMS WAREHOUSE

	Lb.
Aug. 31, 1924:	
Coal-tar dyes and colors	507,338
Coal-tar intermediates	1,081,287
Sept. 30, 1924:	
Coal-tar dyes and colors	559,661
Coal-tar intermediates	1,111,656
Oct. 31, 1924:	
Coal-tar dyes and colors	552,556
Coal-tar intermediates	1,050,037

IMPORTS OF DYES THROUGH THE PORT OF NEW YORK, 1924

	Lb.	Value
January	288,743	$232,571
February	158,874	176,657
March	293,862	302,016
April	174,880	182,253
May	167,245	165,521
June	147,380	151,331
July	140,810	137,075
August	64,546	71,290
September	152,978	159,620
October	440,466	455,787
November	359,260	351,887

FIVE LEADING DYES BY QUANTITY IMPORTED

		Lb.
Indanthrene blue GCD	single strength	18,626
Rhodamine B	single strength	17,220
Ciba violet B	single strength	12,120
Rhodamine 6G	single strength	11,865
Cibanone yellow R	single strength	8,816

PER CENT BY QUANTITY OF COUNTRY OF SHIPMENT

	Per Cent
Germany	45
Switzerland	40
Canada	4
Holland	4
England	3
Belgium	2
Other countries	2

There is included, in the report by the U. S. Tariff Commission, a list of vat dyes with the color strength ratios between paste and power.

Industrial Notes

The Sullivan Machinery Co., Chicago, Ill., announces that its Cleveland office is situated in Room 701, Rockefeller Building, instead of Room 824 in the same building.

The Research Service, Investment Building, Washington, D. C., has recently been organized by Dr. F. H. Newell, formerly head of the Reclamation Service of the U. S. Government and for a number of years connected with the civil engineering department of the University of Illinois; A. B. McDaniel, whose experience is in general civil engineering work and more recently in personnel administration for the government and for industrial concerns, and W. M. Corse, who has specialized in non-ferrous alloys of brass, bronze and nickel, with special reference to foundry practice and business administration. With this staff they are prepared to do a general consulting business along the lines of their experience and are also prepared to act as a representative for national associations, such as trade associations and advertising agencies which want representation in Washington. They are also prepared to act as follows: 1. As an information bureau to obtain technical and scientific information available in Washington from various government and national associations. 2. As a liaison agency for establishing contacts with government departments on legislative matters, also where contracts are involved, or for furthering sales developmental work on material that the government buys. 3. As a high-grade employment agency to secure federal, municipal government and state positions for highly trained technical men. 4. As representatives before Congress for governmental, civil, industrial and business organizations.

French Explosives Manufacture Shows Gain in 1924

Explosives manufacture in France has shown decided recovery during 1924. The principal companies are distributing dividends and many plants which have been closed are resuming operation. The status of the Mexican National Dynamite Co., which was financed in France, continues to be unsatisfactory. Production is continuing, however.

Financial

Devoe & Raynolds, Inc., has declared an extra dividend of 25c. on the common; also regular quarterly dividends of $1.25 on the common and 1¾ per cent on both first and second preferred stocks.

Directors of the Standard Textile Products at their recent meeting took no action on the dividends on the A and B preferred stock, which were omitted for the third quarter.

A meeting of stockholders of the Central Leather Co. will soon be called to take action on the plans for refunding the first 5s, which will mature on April 1.

The committee elected by the debenture holders of Whalen Pulp & Paper Mills, Ltd., which owns three pulp mills and extensive timber limits in British Columbia, is arranging for the re-financing of the company and the construction of a newsprint mill, to assure a market for the company's pulp. Alexander Maclaren, of Buckingham, Que., has been engaged in an advisory capacity.

The report of the Archer-Daniels-Midland Co. and subsidiaries for the year ended Sept. 30 shows net income of $644,213 after depreciation and federal taxes, equivalent after allowing for preferred dividends to $1.47 a share earned on outstanding 200,000 shares of no par common stock.

The report of the receivers for the Southern Cotton Oil Co., a subsidiary of the Virginia-Carolina Chemical Co., states the operation of the business by them from their appointment, March 3, 1924, to Oct. 31, 1924, resulted in an operating profit of $971,678, including operations of subsidiaries.

Men You Should Know About

GEORGE L. BIDWELL of Easton, Pa., formerly superintendent of the Warren Paper Mills, Riegelsville, Pa., has left for a trip around the world, accompanied by his wife, and will not return until early in 1926.

MARION G. BRYCE, chairman of the board of directors of the United States Glass Co., Pittsburgh, Pa., acted as toastmaster at the celebration of the fiftieth anniversary of the American Association of Flint and Lime Glass Manufacturers, recently held at the Fort Pitt Hotel in that city.

CLARENCE G. BULL, of the Sherwin-Williams Co., Cleveland, Ohio, has been appointed general manager of manufacturing.

JOHN A. CAMPBELL, president of the Trenton Potteries Co., Trenton, N. J., presided at a dinner, Dec. 3, given in commemoration of the 120th anniversary of the Trenton Banking Co., the city's oldest financial institution, of which he is president.

C. F. CARRIER is chemical director of the Missouri Paint & Varnish Co. of St. Louis, Mo. He will organize a technical control and research department.

CYRUS S. CHING, director of personnel of the United States Rubber Co., New York, gave a lecture on the subject of "Organizing the Plant Safety Committee" before the members of the Massachusetts Safety Council, Boston, Dec. 2.

HENRY M. DAWES will soon become president of the Pure Oil Co., Columbus, Ohio, succeeding Beman G. Dawes. He has recently resigned as comptroller of the currency, Washington, D. C., to accept the new appointment.

GEORGE B. GREELY, who was formerly with the Rockland & Rockport Lime Corporation of Rockland, Me., is now connected with the Texas Co., at Bayonne, N. J.

JOHN H. HALL, metallurgist of the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., and G. R. Hank, superintendent of the same company, gave addresses on the subject of manganese steel before the members of the Industrial Club, Bethlehem, Pa., at a recent gathering.

H. W. HARDINGE, president of the Hardinge Co., arrived Dec. 4, with Mrs. Hardinge, and his daughter, Mrs. Kiliani, on the "Olympic." Mr. Hardinge has been abroad the greater part of the year on company business.

Dr. ZAY JEFFRIES, head of the research bureau of the Aluminum Co. of America, at Cleveland, Ohio, gave an address on the subject "More About Steel," before the members of the Pittsburgh, Pa., Chapter of the American Society for Steel Treating, at the Fort Pitt Hotel, Dec. 2.

M. J. KIRWIN has resigned as superintendent of the United States Bureau of Mines Station, Bartlesville, Okla., to become production engineer for the Indian Territory Illuminating Oil Co.

Prof. GILBERT N. LEWIS, chemist, prominent in a number of American universities and chief of the Defense Division, Gas Service, A.E.F., in the World War, has been elected an honorary member of the Royal Institution of Great Britain.

E. D. LIBBEY has been re-elected chairman of the board of directors of the Toledo Glass Co., Toledo, Ohio.

ELLERY W. MANN has been elected president of the Zonite Products Co., New York, manufacturer of antiseptics, etc.

A. E. MARSHALL, consulting engineer, of Baltimore, has recently returned from a trip to Europe.

JOHN NORVIG, formerly chief engineer of the New Jersey Zinc Co., has joined the staff of the International Portland Cement Co. in the same capacity.

JOHN L. PARSONS, fellow, Yale University, will continue his studies during the present school year on oxy-cellulose, under the direction of Prof. Harold Hibbert, through a renewal of the fellowship by the Hammermill Paper Co.

W. A. PETERS has severed his connection with the du Pont company and joined the staff of the E. B. Badger & Sons Co., Boston. He will devote himself principally to problems in the petroleum industry.

J. D. UMPLEBY, formerly a member of the U. S. Geological Survey, was in Washington recently conferring with Survey geologists in regard to the Bradford oil sands.

M. P. YOUKER has been appointed general superintendent of refineries of the Waite Phillips Petroleum Co., Bartlesville, Okla.

At a recent meeting of the United States Potters Association, Fred B. Lawrence, secretary and treasurer of the North American Manufacturing Co., Newell, W. Va., was elected president, succeeding William Scammell, head of the Scammell China Co., Trenton, N. J., who has occupied this position during the past year. W. C. George, of the W. S. George Pottery Co., East Palestine, Ohio, has been elected second vice-president. Charles F. Goodwin, East Liverpool, Ohio, has been re-elected secretary and treasurer.

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Smithsonian Institution, Washington, D. C., Dec. 29 to Jan. 3.

AMERICAN CERAMIC SOCIETY, annual meeting, Columbus, Ohio, Feb. 16 to 21, 1925.

AMERICAN CHEMICAL SOCIETY, New York Section, Jan. 9.

AMERICAN ELECTROCHEMICAL SOCIETY, Niagara Falls, April 23 to 25.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, Niagara Falls, N. Y., June 4 to 6.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-eighth annual meeting, Atlantic City, N. J., June 22 to 26.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, twenty-third annual convention, Prince George Hotel, Toronto, Canada, Jan. 20 to 22.

CANADIAN PULP AND PAPER ASSOCIATION, Montreal, Jan. 28 to 30.

COMPRESSED GAS MANUFACTURERS ASSOCIATION, twelfth annual meeting, Hotel Astor, New York, Jan. 26.

INSECTICIDE AND DISINFECTANT ASSOCIATION, eleventh annual meeting, New York, Dec. 15 and 16.

NEW JERSEY CLAY WORKERS, New Brunswick, N. J., Dec. 19.

SOUTHERN EXPOSITION, Grand Central Palace, New York, May 11 to 23.

Obituary

CALVIN GREEN of Lewistown, Pa., a retired leather manufacturer, died at his home in that city on Dec. 2, aged 79 years. At one time he operated at Lewistown, Saltillo and Mount Union, Pa., and at Salem and Roanoke, Va., disposing of his interests in 1902, when the company name was changed to Calvin Green & Sons. He was a trustee of Bucknell University, Lewisburg, Pa., for many years, and a director of the Mann Edge Tool Co., Lewistown.

W. R. HIBBIE of Schuylerville, N. Y., a retired paper manufacturer, died in St. Petersburg, Fla., Dec. 4.

FRANK W. HILLS, comptroller of the American Smelting & Refining Co., New York, since 1901, died suddenly at his local residence, Dec. 1, following a short illness.

Colonel THOMAS E. HUFFINGTON, secretary and treasurer of Robert H. Foederer & Co., Philadelphia, leather tanners, died at his residence on Pine St., Dec. 3, aged 79 years. He had held the positions noted with the Foederer company for the past 30 years. Colonel Huffington is survived by two sons and three daughters.

HARRY W. JACKSON, general manager of the Jackson China Co., Falls Creek, Pa., was shot and killed by a demented former employee of the company, on Nov. 27, while at DuBois, Pa.

TOM H. TAYLOR, who for nearly 35 years was business manager of the Riordon Paper mills at Herriton and Hawkesbury, Ont., died at his home in Westmount, Que., recently. He was in his eighty-fourth year.

HERMAN WIEDENHEFT of Pittsburgh, Pa., for the past 42 years superintendent at the local plant of the D. O. Cunningham Bottle Works, died at his home on the South Side, Nov. 27. He was an expert in glass manufacture. Mr. Wiedenheft is survived by his wife, three sons and three daughters.

Market Conditions

Prices for Chemical Products Continue to Show Upward Trend

Weighted Index Number Advanced During Week—Recent Buying Has Largely Eliminated Selling Pressure

THE weighted index number for the week was 158.22 as compared with 156.31 for the preceding period. While some of the important allied products have a part in putting up the index number, considerable influence also has come from miscellaneous chemicals and the trend of the latter as a whole is upward. In some cases values have appreciated as a result of higher production costs but in the majority of cases the upward swing was caused by a freer consuming demand and a consequent reduction in surplus stocks and the gradual elimination of selling pressure.

The contract movement in heavy chemicals has been large and producers will enter the new year with a good part of their output sold ahead. The position of various consuming trades has improved materially since early fall and this presages large consumption of chemicals and other raw materials in 1925. Recent export statistics have been encouraging and the outlook favors a continuance of large shipments to outside markets. The reduction in duties on coal tars and dyes has resulted in larger imports of these commodities and it is difficult to state what the ultimate effect will be on the home industries.

The metal markets are holding at high levels and metal salts are affected accordingly. Consumers of tin salts are paying higher prices for December deliveries than had been in effect in recent months and last week producers of red lead, litharge, and orange mineral announced an increase of one-half cent per lb. in these commodities.

Calcium arsenate has not recovered from the depressing influence of last season. Ordinarily active buying would be in order at this time for arsenic and calcium arsenate, yet these markets are practically neglected and some factors in the trade admit that if arsenate consumption can be figured on last season's standard there is practically enough goods held in store to satisfy all needs. Hence activity in the arsenic market is awaiting call for arsenate with no indication of an immediate change in the situation.

Acids

Most of the acids are in a firm position as far as prices are concerned. This has followed a period of more active buying and a corresponding lessening in selling competition. Oxalic acid is still under some pressure with foreign and domestic makes competing keenly. More interest has been taken in citric and tartaric acids especially for forward deliveries. Imported citric is quoted at 45½@46c. per lb. and imported tartaric at 26½c. per lb. Domestic citric is held at 46@47c. per lb. and domestic tartaric at 30c. per lb. Lactic acid has strengthened and sellers are asking 6½@7c. per lb. for light, 22 per cent and 13½@14c. per lb. for light, 44 per cent. The higher price schedule is due to better consuming demand and to higher costs of production. Calls for delivery of acetic acid against contracts is improving and surplus stocks have been reduced. There is a normal call for boric acid but sellers are competing keenly and prices are kept at former levels. The mineral acid group has worked into a healthy position with a fair buying for prompt shipment and a steady movement against contracts.

Lead Oxides Advanced in Price — Potash Salts Quoted for January-April Delivery — Bichromates Continue in Easy Position—Imported Sulphate of Ammonia in Demand—Arsenic Neglected—Copper Sulphate Easy—Bleaching Powder Quiet—Chlorate of Potash Firm — Export Demand for Caustic Soda—Good Call for Denatured Alcohol

Potashes

Bichromate of Potash—The market preserves an easy tone with sellers open to bids and values irregular. Some reports credit sales at 8½c. per lb. with quotations generally ranging from 8¼c. to 8½c. per lb.

Caustic Potash—While recent imports of caustic potash have been large, a good part of arrivals has gone direct to consumers. This serves to cover requirements for the present and also to limit the volume of caustic held in the spot market. Spot buying is reported to be quiet and very little change is found in values. One lot was reported to have been offered at 9c. per lb., ex-dock, with goods ex-warehouse generally held at 9½@9¾c. per lb. Domestic makers continue to offer round lots at 7½c. per lb., at works.

Chlorate of Potash—Foreign markets are reported to be higher and this has had some effect on domestic markets. Some sellers of spot chlorate are reserved and quotations are heard from 7¼c. to 7½c. per lb. Predictions of higher prices are current and these predictions appear to be based on reports of extensive short interests in the market.

Muriate of Potash—Representatives of German producers have announced their readiness to accept orders for shipment from abroad and they guarantee the prices against their own decline up to the end of April. The prices are on a basis of the short ton and include other potash salts in addition to muriate. The quotations, which are subject to the usual quantity discounts, are:

	Bags	Bulk
Muriate of potash 80 to 85 per cent, basis 80 per cent	$34.55	$33.30
Sulphate of potash 90 to 95 per cent, basis 90 per cent	45.85	44.60
Sulphate of potash-magnesia 48 to 53 per cent, basis 48 per cent	26.35	25.10
Manure salt 30 per cent	10.03	17.03
Manure salt 20 per cent	12.55	10.55
Kainit 14 per cent	10.25	8.25
Kainit 12.4 per cent	9.75	7.75

Prussiate of Potash—The shipment market for foreign yellow prussiate has held firm at 16½c. per lb. and holders of spot material have placed 16¾c. per lb. as their lowest selling price. Demand is not active but current prices are said to be low based on producing costs and there is no sign of weakness in the market.

Sodas

Bichromate of Soda—Export inquiry was a feature of the week and foreign markets were interested in round lots. One inquiry for a large lot for shipment to Japan brought out a quotation of 6c. per lb. The market was practically unchanged from the preceding week with some factors willing to sell at 6¼c. per lb. and others holding at higher levels. It was possible to pick up small lots at 6¼c. per lb. and producers who are not willing to meet the low prices are securing very little business.

Caustic Soda—A better inquiry was reported for export and some good sized lots changed hands. One lot was said to have been sold at $2.70 per 100 lb. f.a.s. but other sellers said the lowest price was $2.87½ per 100 lb. and up to $3.05 per 100 lb. was asked. Prices for export varied according to seller and to destination of shipment. There were reports of sales for domestic consumption under the open quotation as it was stated that sales were made on a delivered basis where the subtraction of transportation charges would leave a net price at works of about $3.05 per 100 lb. Producers, however, reported no change in quotations and asked $3.10 per 100 lb. at works for carlots on contract for 76 per cent solid, with

spot cars at works held at $3.20 per 100 lb. Production is said to have been reduced through the temporary closing of one large plant but this was said to have resulted from no accumulation of stocks of caustic but in order to hold down surplus of by-products.

Fluoride of Soda—Stocks of imported fluoride have been well absorbed and holders have been firm in their views. Asking prices for spot goods are 8¾@9c. per lb. with domestic at the same level.

Nitrite of Soda—Under moderate inquiry from consumers the market has held a steady tone with spot goods at 9¼c. per lb Shipments from abroad are maintained at 9c. per lb. Domestic nitrite is steadily held at 9c. per lb. on basis of prompt shipment from works. There is a steady movement of domestic nitrite against contracts.

Miscellaneous Chemicals

Arsenic—There is very little life to this market. Speculative trading has been at a minimum because of the disastrous experience of last year and because of reports that large stocks are held here. The fact that stocks of calcium arsenate, which is looked to as the largest outlet for arsenic, are large also has a depressing influence on trading. For shipment from Japan, importers quote 6¼c. per lb. and domestic arsenic is held at 6½@6¾c. per lb.

Bleaching Powder — The fact that some producers are carrying large stocks has been a market factor and recent call for deliveries has not been large enough to make inroads on these accumulations. One producer is reported to have curtailed production until stocks have been lowered. There is no indication of weakness in prices and the contract price remains at $1.90 per 100 lb. in large drums, carlots, at works.

Copper Sulphate—While the metal market has been strong it has been disregarded by some sellers of sulphate and domestic material has been on the market as low as 4.35c. per lb. This is under the price quoted for foreign material as the latter is held at 4½c. per lb. for shipment. The price for domestic sulphate, however, varies according to grade and seller with 4.65@4.75c. per lb. asked for some of the standard brands.

Carbon Tetrachloride — Competition has been less in evidence and buyers are finding more stability to prices. Offerings have been reduced in volume and current quotations are on a basis of 6¾c. to 7c. per lb. according to seller and quantity.

Sulphate of Ammonia—Domestic demand is taking the output and producers have practically nothing to offer for prompt shipment. Prices are quoted at $2.75@$2.80 per 100 lb. in bulk, at works. Some reports say that production is increasing and that the increase in supply soon will be apparent in the market. In the meantime there are reports that very large amounts of German synthetic sulphate have been sold for delivery to this country. A report from London states that in the past 18 months there has been an increase in sulphate consumption of nearly 200,000 tons on a total world production of about 2,500,000 tons.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	158.22
Last week	156.31
Dec., 1923	165.00
Dec., 1922	164.00
Dec., 1921	145.00
Dec., 1920	189.00
Dec., 1919	245.00
Dec., 1918	277.00

Higher prices were named for red lead, litharge, orange mineral, crude cottonseed oil and linseed oil, resulting in a 191 point rise in the weighted index number.

Barium Chloride—Offerings of both foreign and domestic material numerous and market unsettled. Domestic makers held out for $70 per ton, with imported material available for immediate delivery at $64@$65 per ton. Imported for future delivery nominal at $63 per ton.

Litharge—Demand good and with the metal higher corroders advanced prices ½c. per lb., establishing the trading level at 11¾c. per lb., in bbl.

Orange Mineral—Reflecting a higher market for pig lead the price was raised to 15¼c. per lb., a net gain of ½c. per lb.

Red Lead—An advance of ½c. per lb. in dry red lead was announced on Thursday by leading producers. This establishes the market at 12¼c. per lb., in bbl. or casks.

Sal Ammoniac—Domestic makers report good business in sal ammoniac, notwithstanding freer offerings of foreign goods, and market continued firm. Imported white available on spot at 5⅞@6c. per lb., with futures nominal at 5¾c. per lb.

Coal-Tar Products

Stocks of Benzene Small and Prices Hold Firm— Good Inquiry for Aniline Oil—Creosote Steady Abroad

Demand for benzene was sufficient to absorb production and first hands reported rather small spot holdings, resulting in a firm market. With the iron and steel industries entering upon a period of greater activity consumers feel that the output of coal-tar crudes soon will show substantial gains and most buyers are inclined to restrict purchases to nearby requirements. On the other hand producers say that new business has been satisfactory from the standpoint of volume and the market is in a position to absorb even greater quantities of crudes than are now in sight. In the division for intermediates the situation is gradually improving. A feature in the market is the firmer position of aniline oil, the demand for this material being much better than a month ago. Refined naphthalene is not moving so freely on contract, yet producers are not forcing sales. Phenol was regarded as firm, but the price held on the 24c. per lb. basis. Stocks of intermediates in bonded warehouse on Oct. 31 amounted to 1,050,037 lb., which compares with 1,110,656 lb. a month previous.

Alpha-naphthylamine — There has been some improvement in buying, and the market closed steady at 35c. per lb., immediate shipment from works.

Aniline Oil and Salt—Demand for aniline oil continues good, both for immediate and forward delivery, and the undertone in most quarters was quite firm. There was some talk of a higher market, but leading producers offered material on the old basis of 16c. per lb., drums extra, carload lots, shipment from works, all positions. Aniline oil for red was nominally unchanged at 40c. per lb. Aniline salt held at 21@23c. per lb., as to seller and quantity.

Benzene — Offerings moderate and prices firm, but quotably unchanged on the basis of 23c. per gal. for the 90 per cent grade, tank cars, f.o.b. works. Demand has been good, especially for the motor fuel grades. Exports from the United Kingdom for the 10 months ended Oct. 31 amounted to 1,289,187 gal., which compares with 1,566,140 gal. for the corresponding period a year ago.

Creosote Oil — Domestic offerings meager and market largely nominal, production being sold up in nearly all directions. Foreign markets steady. Manchester advices state that American buyers have been holding off, but position of market good. Prices steady, ranging from 5¾@6d. per gal., bulk basis, f.o.b. point of shipment. In the 10 months ended Oct. 31 the United Kingdom exported 36,030,052 gal. of creosote and tar oil, which compares with 42,691,654 gal. for the same time a year ago.

Cresylic Acid—Market inactive and prices barely steady. On contract there were sellers of 97 per cent material at 59@60c. per gal., in drums, carload lots. For spot material prices ranged from 62@65c. per gal.

Ortho-nitrotoluene — Demand good and with stocks small prices are firm 8½@9c. per lb., in drums, f.o.b. works.

Naphthalene—White flake for delivery over 1925 held at 5½c. per lb. Demand has been disappointing, but sellers not willing to force business. The strength in futures has steadied the spot market. Chipped naphthalene nominal at 4½c. per lb. Crude to import offered at 2c. per lb., c.i.f. basis. English markets for good quality crude barely steady at £7@£8 per ton, works.

Phenol — Deliveries against existing contracts good and supplies on hand rather limited. Market firm, makers asking from 24@25c. per lb., the inside figure prevailing for large drums, immediate and forward shipment.

Paranitraniline—Competition tends to unsettle market. Demand has been better, but offerings fairly liberal at 65@67c. per lb., according to seller.

Pyridine—Some spot material sold down to $3.85 per gal., according to reports. Demand moderate only and prices irregular. Closing prices ranged from $3.90@$4.10 per gal.

Vegetable Oils and Fats

Cottonseed Oil Higher on Strength in Lard—Linseed Oil Advances—Olive Oil Foots Strong—Tallow Active

TRADING in vegetable oils was not active, but continued strength in speculative commodity markets exerted more than passing influence and caused prices to hold on a comparatively firm basis. In the past week crude cottonseed oil was purchased by refiners at an advance of ¼c. per lb. Linseed oil attracted more attention, because of the strength in seed, and the price was marked up on 3 different occasions. Another bulk lot of English palm kernel oil was purchased by soap makers. Lagos palm oil and soya bean oil for future delivery were unsettled. Olive oil foots were active and higher. A round lot of tallow sold at higher prices.

Cottonseed Oil—The December report on cotton issued by the Department of Agriculture placed the crop at 13,153,000 bales, which compares with 12,992,000 bales, the forecast made a fortnight ago. The Census Bureau reported that 12,225,025 bales of cotton had been ginned prior to Dec. 1. Based on the ginning figures trade authorities believe that estimated production of cotton is too low. In any event the news was regarded as bearish for cottonseed oil, but prices again worked to higher levels under the stimulus of higher lard. The action of cottonseed oil prices reflected fluctuations in pure lard at all times and many traders now feel that this condition will obtain over the winter period. As matters stand refiners are short of oil in the option market, while the speculative element is backing the long side. Refiners sold the options against purchases of crude and the sales actually net them a small profit. The speculators, in a number of instances, bought oil against sales of lard contracts. On Thursday the option market for refined oil was from 21 to 25 points higher than a week ago. December refined oil settled at 11.15@11.17c. per lb., with January at 11.18@11.20c. per lb., and May at 11.59@11.60c. per lb., in bbl. Crude oil sold in the Southeast at 9½c. per lb., tank cars, f.o.b. mills, while in Texas 9⅝c. was paid, same basis. Lard compound advanced to 13½c. per lb., in bbl., carload lots. Pure lard in Chicago settled with the cash position at 16.02c. per lb. Export demand for both oil and lard was less active, owing to the higher prices.

Linseed Oil—Closing prices for linseed oil were from 5@6c. per gal. higher than a week ago. December-March oil settled at $1.10@$1.11 per gal., with April forward at $1.12 per gal., carload lots, cooperage basis. The advance in oil reflected higher prices for flaxseed, the Duluth market being quite active on covering of December contracts by speculators. At one time December seed was 16c. per bu. higher than a week ago, but before the close a reaction set in on general unsettlement in grains. December flaxseed at Duluth settled at $2.79, with January at $2.82 and May at $2.84½ per bu. Receipts of domestic seed at Minneapolis and Duluth since Sept. 1 amounted to 23,150,000 bu., and operators seem more inclined to take the official estimate on production more seriously. The final report on flaxseed for 1924 will be issued this week. Rains were more numerous in the Argentine, but this was not a favorable development as excessive moisture at this time would only retard harvesting. Crop estimates again varied considerably, but most crushers are basing calculations on an exportable surplus of 36,000,000@38,000,000 bu. In 1924 Europe consumed more than 40,000,000 bu. of Argentine seed, so the outlook for 1925 is regarded as bullish. Large consumers of oil are pretty well covered against early 1925 requirements, but much buying will have to be done to provide for second quarter needs. Linseed cake for export was firm at $47.50 per ton, f.a.s. New York.

Argentine Official Estimate Raises Linseed Area

The Rural Economy and Statistical Bureau of the Argentine Ministry of Agriculture in its third report on area sown to linseed places the total for the 1924-25 season at 2,420,000 hectares, which compares with 2,390,000 hectares in the second report and 2,300,000 hectares in the first report. The first report estimated the yield at 1,300,000 tons (53,200,000 bu.), which would provide for an exportable surplus of 1,180,000 tons (47,200,000 bu.).

The area sown to linseed, according to provinces, follows:

	*Hectares
Buenos Aires	607,500
Santa Fe	744,500
Cordoba	364,500
Entre Rios	549,300
Pampa, etc.	154,200
Total	2,420,000

*Hectare = 2.471 acres.

China Wood Oil—Buyers could not be interested and the market was easier. On the Pacific coast there were sellers at 14c. per lb., tank car basis. In New York the market for oil in cooperage settled at 15¼@15¾c. per lb., the inside figure obtaining for nearby material.

Corn Oil—Crude oil in the Middle West was offered at 10¼c. per lb., tank cars. Crude oil on spot, New York, in bbl., sold at 12½c. per lb.

Coconut Oil—There was talk of an easier market, but prices underwent little change. On the Pacific coast nearby oil sold at 9½c. per lb., tank car basis, with intimation that 9⅝c. might be done on first half of 1925 business. In New York 10¼c. was asked for prompt oil, and 9¾@10c. on futures, tank car basis.

Olive Oil Foots—Cables were higher on advices that Germany bought Italian foots. Sales took place here at 9⅜@9⅝c. per lb., an advance of ⅛c. for the week.

Palm Kernel Oil—Additional bulk business went through, but at a slight advance, traders naming 9⅜@9⅝c. as prices paid. Soap makers were the buyers.

Palm Oils—Lagos oil for early 1925 delivery was offered at 9⅝c. per lb. Spot material held around 9¾c. per lb. Niger for nearby delivery held at 8¾c. per lb. Market easier on futures.

Soya Bean Oil—Crude oil sold in bulk at 8.20c. per lb., c.i.f. Pacific coast ports. Later there were sellers of December-January at 11⅝c. per lb., tank cars, duty paid.

Fish Oils—North Carolina crude menhaden oil was offered at 53½c. per gal., tank cars, fish factory. Last sales of Chesapeake bay oil went through at 55c. per gal., f.o.b. Baltimore. Tanked cod oil was steady at 63@65c. per gal., in bbl. Sardine oil nominal at 52c., tank cars, Pacific coast.

Tallow, Etc.—Sales of 1,000,000 lb. of extra special and city special tallow made to soapers. The extra sold at 10¼c. per lb., an advance of ¼c. from the previous "official" trading basis. Oleo stearine nominal at 12c. per lb.

Miscellaneous Materials

Antimony—Arrivals have been larger, but prices ruled steady on improved buying interest. Chinese brands 14⅜@14½c. per lb. Cookson's "C" grade held at 17⅞c. per lb. Chinese needle, lump, nominal at 10c. per lb. Standard powdered needle, 200 mesh, 11½c. per lb. White oxide, Chinese, 99 per cent, 13@14c. per lb.

Glycerine—Sales of dynamite in the Middle West reported at 17½c. per lb., an advance of ¼c. Inquiry better and holders now ask 17¾c., carload basis. Chemically pure steady at 19c. asked, in drums, f.o.b. New York. Crude soap lye, basis 80 per cent, firm at 12@12¼c. per lb., loose, carload lots, f.o.b. point of production.

Naval Stores—Demand for spirits of turpentine in evidence and market firmer, closing at 84@85c. per gal., a gain of 3c. per gal. Rosins also higher, the lower grade settling at $7.50@$7.60 per bbl.

White Lead—The higher market for pig lead resulted in no change in the white lead group. Standard dry white lead held at 10½c. per lb., with the sublimed at 10c. per lb., in bbl. or casks, carload lots. The market, however, was firmer.

Alcohol

Demand for denatured alcohol was fairly active. The call for the special grades used for anti-freezing purposes shows a steady gain and stocks in the hands of distributors have been reduced to a rather low point. Producers held to the old schedule of prices, special denatured, formula No. 1, in drums, moving at 55@55½c. per gal., carload basis. The undertone of the market was strong.

Methanol prices underwent no change, with offerings liberal in most quarters. Quotations held on the basis of 72c. per gal., in drums, on the 97 per cent grade, carload lots. Butyl alcohol was in good demand and firm at 27@30c. per lb.

Imports at the Port of New York

December 5 to December 11

ACIDS—Citric—200 bbl., Messina, Order. **Cresylic**—4 dr., Glasgow, Order. **Oxalic**—20 csk., Antwerp, Order. **Tartaric**—1,800 csk., Palermo, Order.

ALCOHOL — 122 bbl. denatured, San Juan, Olivett Dist. Co.; 300 bbl. do., Arecibo, C. Estevas; 260 bbl. do. and 40 dr. do., Aquadilla, C. Estevas.

ALUMINUM HYDRATE—10 csk., Havre, Order.

ANTIMONY REGULUS—180 cs., Shanghai, Wah Chang Trading Co.; 250 cs., Shanghai, F. A. Cundill & Co.; 500 cs., Shanghai, I. R. Boody & Co.; 500 cs., Shanghai, American Trading Co.; 500 cs., Shanghai, Standard Bank of South Africa; 500 cs., Shanghai, Irving Bank-Col. Trust Co.; 100 cs., Shanghai, Order.

ASBESTOS—2,250 bg. crude, Beira, R. D. Crumpton & Co.

BARYTES—200 bg., Bremen, New York Trust Co.

BRONZE POWDER — 18 cs., Bremen, Gerstendorfer Bros.; 5 cs., Bremen, L. Uhlfelder.

CARBON—441 bg. decolorizing, Rotterdam, L. A. Salomon & Bro.

CASEIN—834 bg., Buenos Aires, Order.

CHALK—425 bg., Bristol, H. J. Baker & Bro.; 300 bg., Antwerp, Order; 400 bg., Havre, S. L. Libby Corp.; 550,000 kilos, Dunkirk, Taintor Trading Co.; 800,000 kilos, Dunkirk, J. W. Hegman Co.

CHEMICALS—20 cs., Hamburg, Order; 27 cs., Bremen, Mallinckrodt Chemical Works; 394 cs., Havre, International Banking Corp.; 100 bbl. and 125 csk., Bremen, A. Klipstein & Co.; 23 pkg., Bremen, H. B. Bishop; 100 csk., Rotterdam, Hans Henrichs Chem. Co.; 25 cs., Rotterdam, Alpers & Mott; 100 csk., Rotterdam, Stanley, Doggett, Inc.; 392 pkg., Rotterdam, Order; 548 bg., Glasgow, Brown Bros. & Co.; 280 bg., Glasgow, Coal & Iron National Bank.

CHROME ORE—1 lot (in bulk), Beira, E. J. Lavino & Co.

COAL-TAR DISTILLATE—48 dr., Liverpool, Monsanto Chemical Works; 122 dr., Liverpool, Order.

COAL-TAR INTERMEDIATES—50 csk. dephenylamine, Rotterdam, H. A. Metz & Co.

COLORS—27 pkg. aniline, Havre, American Exchange National Bank; 10 csk., Havre, Reichard-Coulston, Inc.; 61 pkg. aniline, Havre, Ciba Co.; 7 pkg. do., Havre, Carbic Color & Chem. Co.; 15 csk., Havre, Order; 73 csk. umber, Hull, L. H. Butcher & Co.; 54 csk. ultramarine blue, Hull, Van Oppen & Co.; 17 bbl. aniline, Genoa, Irving Bank-Col. Trust Co.; 4 cs. do., Genoa, American Exchange National Bank; 4 dr. do., London, American Aniline Co.; 5 pkg. aniline, Havre, Irving Bank-Col. Trust Co.; 21 pkg. do., Havre, Sandoz Chemical Works; 19 pkg. do., Havre, Ciba Co.; 6 csk. do., Havre, Carbic Color & Chem. Co.; 21 cs. do., Havre, Geigy Co.; 69 pkg. aniline, Rotterdam, H. A. Metz & Co.; 82 pkg. do., Rotterdam, Kuttroff, Pickhardt & Co.

CREAM TARTAR—100 csk., Rotterdam, W. Newburg.

FULLERS EARTH—500 bg., Bristol, L. A. Salomon & Bro.

FUSEL OIL—2 csk., Antwerp, National City Bank; 3 bbl., Vancouver, Order.

GLYCERINE — 12 dr. crude, Dunkirk, Order.

GLUE — 300 bg., London, Gallagher & Ascher.

GUMS—300 cs. damar, Batavia, Innes & Co.; 100 cs. do., Batavia, Guaranty Trust Co.; 1,050 cs. do., Batavia, Order; 155 pkg. copal, Macassar, France, Campbell & Darling; 557 pkg. do., Macassar, Brown Bros. & Co.; 123 pkg. do., Macassar, Patterson, Boardman & Knapp; 55 pkg. do., Macassar, A. Klipstein & Co.; 311 pkg. do., Macassar, W. H. Scheel; 1,182 pkg. copal, Macassar, S. Winterbourne & Co.; 264 pkg. do., Macassar, Kidder, Peabody Accept. Corp.; 267 pkg. do., Macassar, Equitable Trust Co.; 199 pkg. do., Macassar, Standard Bank of South Africa; 2,256 pkg. copal, Macassar, Order; 7 cs. damar, Belawan, Order; 105 bg. damar, Singapore, Goschens & Cunliffe; 214 pkg. do., Singapore, Gillespie & Sons; 470 cs. do., Singapore, Order; 700 cs. damar, Batavia, Stein, Hall & Co.; 73 bg. copal, Singapore, Brown Bros. & Co.; 67 bg. copal, Manila, Innes & Co.; 200 bg. do., Manila, Chartered Bank of India, Australia & China; 118 bg. copal, London, Toch Bros.; 198 cs. arabic, Liverpool, Brown Bros. & Co.; 27 bg. tragacanth, London, Bank of Montreal.

IRON OXIDE—160 bg., Bristol, G. Z. Collins & Co.; 90 csk., Bristol, Reichard-Coulston, Inc.; 26 csk., Bristol, Order; 70 csk., Hull, J. D. Smith & Co.; 46 bbl., Malaga, L. H. Butcher & Co.; 54 bbl., Malaga, Moore-McCormick Line; 226 bbl., Malaga, Reichard-Coulston, Inc.; 298 bbl., Malaga, C. J. Osborn Co.; 446 bbl., Malaga, C. K. Williams & Co.; 108 bbl., Malaga, Hummel & Robinson Corp.; 160 bbl., Malaga, American Hawaiian S.S. Co.; 5 csk., Marseilles, Waters & Co.; 20 csk., Liverpool, J. A. McNulty; 10 csk., Liverpool, J. Weitzner & Co.; 9 csk., Liverpool, J. H. Rhodes & Co.; 25 csk., Liverpool, Order.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ALUM, LUMP. Amritsar, India. Purchase and agency.—12,580.

ALUM and chrome alum in crystals. Libau, Latvia. Purchase.—12,576.

AGRICULTURAL DISINFECTANTS. Johannesburg, South Africa. Agency. —12,595.

PAINTS, varnishes and enamels. Melbourne, Australia. Purchase.—12,579.

CAUSTIC SODA. Amritsar, India. Purchase.—12,577.

TAR OIL. Athens, Greece. Purchase. —12,578.

OILS AND TALLOW. Wesel, Germany. Agency.—12,512.

LOGWOOD EXTRACT—100 cs., Kingston, British Dyewood Co.

MAGNESITE — 250 bg. and 122 csk., Rotterdam, Brown Bros. & Co.

MAGNESIUM CHLORIDE — 104 dr., Hamburg, Innis, Speiden & Co.

MANGANESE ORE—100 bg., Liverpool, Electro Metallurgical Co.

MANGROVE BARK—500 bg., Singapore, Order; 2,000 bg. extract, Singapore, Order.

MYROBALANS — 1,840 pkt., Calcutta, Order; 1,400 pkt., Calcutta, National City Bank; 1,812 pkt., Calcutta, Order.

MINERAL WHITE—100 bg., Hull, L. A. Salomon & Bro.; 100 bg., Hull, Whittaker, Clarke & Daniels.

OCHER—55 csk., Marseilles, American Exchange National Bank.

OILS—Coconut—965,948 lb. (in bulk), Manila, National City Bank; 990,236 lb. (in bulk), Manila, American Linseed Co.; 61 hhds., London, Brown Bros. & Co. **China Wood**—134 dr., Shanghai, Williams Commission Co.; 300 csk., Shanghai, Bingham & Co.; 650 tons (in bulk), Shanghai, National City Bank. **Cod**—180 csk., St. Johns, R. Badcock & Co.; 500 csk., St. Johns, National Oil Products Co.; 58 csk., St. Johns, Swan & Finch Oil Corp. **Linseed**—156 dr., Hull, International Composition Co.; 60 bbl., Hull, Order. **Olive foots** (sulphur oil) —300 bbl., Piraeus, Order. **Palm kernel**—368 csk., Hull, Order. **Palm**—232 csk., Abonnema, Irving Bank-Col. Trust Co.; 650 csk., Burutu, Irving Bank-Col. Trust Co.; 462 csk., Liverpool, African & Eastern Trading Co.; 91 csk., Liverpool, Order; 320 csk. and 30 bbl., Liverpool, Order. **Rapeseed** —50 bbl., Hull, Balfour, Williamson & Co.; 240 bbl., Hull, J. C. Francesconi & Co.; 700 bbl., Hull, Order; 50 bbl., London, W. B. Dick & Co. **Sperm**—250 bbl., Glasgow, Baring Bros. & Co.

OILSEEDS—Copra—1,250 bg., Trinidad, Order. **Castor**—1,545 bg., Calcutta, Order; 200 bg., Pernambuco, Seaboard National Bank; 3,330 bg., Pernambuco, Order. **Sesame**—201 bg., Smyrna, Order; 500 bg., Smyrna, A. Benadava.

PLUMBAGO—572 bg., Colombo, Order.

POTASSIUM SALTS — 250 csk. alum, Hamburg, Order; 1,000 bg. muriate, Bremen, Potash Importing Corp. of America; 1,006 bg. nitrate, Rotterdam, Kuttroff, Pickhardt & Co.; 36 kegs prussiate, Liverpool, Order; 10 cs. bromide, London, Lo Curto & Funk.

QUEBRACHO—1,193 bg., Buenos Aires, Order; 5,709 bg., Buenos Aires, International Products Co.

SAL AMMONIAC—150 csk., Bristol, C. de P. Field Co.; 200 bbl. fluoride, Rotterdam, Innis, Speiden & Co.

SHELLAC — 600 bg., Calcutta, Order; 1,291 bg. Calcutta, Philadelphia National Bank; 100 bg., Calcutta, Standard Bank of South Africa; 100 bg., Calcutta, MacLac Co.; 150 bg., Calcutta, Marx & Rawolle; 479 bg., Calcutta, Philadelphia National Bank; 433 bg., Calcutta, Order; 77 cs., Marseilles, Order; 16 cs., Rotterdam, C. F. Gerlach.

SODIUM SALTS—50 dr. sulphite, Bristol, R. F. Downing & Co.; 50 csk. nitrite, Hamburg, E. Suter & Co.; 3,540 bg. nitrate, Skien, Order; 200 bbl., Rotterdam, Innis, Speiden & Co.; 44 csk. prussiate, Liverpool, Order; 50 kegs hydrosulphite, Liverpool, W. Mohrmann; 150 dr. cyanide and 121 cs. do., Liverpool, Order; 12,039 bg. nitrate, Taltal, W. R. Grace & Co.; 8,152 bg. do., Iquique, W. R. Grace & Co.

SUMAC—640 bg., Larnaca, P. M. Tseriotl.

TALLOW—150 tcs., Vancouver, Order.

TARTAR—403 bg., Alicante, Royal Baking Powder Co.; 50 bg., Alicante, R. F. Downing & Co.; 100 bg., Alicante, Archibald & Lewis; 150 bg., Alicante, Lundt & Co.; 120 bg., Alicante, Order; 303 bg., Marseilles, Royal Baking; 100 bg., Marseilles, C. Pfizer & Co.

UMBER—2,035 bg., Larnaca, Reichard-Coulston, Inc.; 880 bg., Larnaca, J. Lee Smith & Co.

VALONEA—7,774 bg., Smyrna, Order.

WAXES — 37 bg. beeswax, Clenfuegos, Order; 29 bg. beeswax, Alexandria, Order; 16 bbl. beeswax, Rio de Janeiro, D. Steengrafe; 111 bg. carnauba, Ceara, Strohmeyer & Arpe; 30 bg. do., Ceara, N. Y. Trust Co.; 176 bg. do., Ceara, National City Bank; 313 bg. do., Ceara, Lazard Freres; 803 bg. do., Ceara, Order.

WOOL GREASE — 200 bbl., Bremen, American Exchange National Bank.

ZINC OXIDE—50 bbl., Marseilles, Order.

Apparatus Used by Pasteur Donated to Columbia

Columbia University has just received three pieces of glass apparatus which were used by Louis Pasteur while he was dean of the faculty of arts and sciences at the University of Lille, from 1854 to 1857. The apparatus, which was sent by Professor Pascal, dean of the school of chemistry at Lille, will be exhibited permanently in the Chandler Chemical Museum.

Yale to Make County-Wide Survey of Transportation Problem

Plans for a country-wide survey of the transportation problem in its engineering and economic aspects were made public by Yale University on Dec. 4. The survey will be conducted by Winthrop M. Daniels, professor of transportation; Samuel W. Dudley, professor of mechanical engineering; and Charles J. Tilden, professor of engineering mechanics.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

Dyes	**Paper and Pulp**
Paint and Varnish	**Petroleum**
Ceramic Materials	**Soap**
Fertilizers	**Explosives**
Rubber	**Food Products**
Sugar	**Metal Products**

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

Industrial Chemicals

Acetone, drums, works	lb.	$0.15 –	$0.16
Acetic anhydride, 85%, dr.	lb.	.34 –	.36
Acid, acetic, 28%, bbl.	100 lb.	3.12 –	3.37
Acetic, 56%, bbl.	100 lb.	5.85 –	6.10
Acetic, 80%, bbl.	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs	lb.	.45½–	.46½
Formic, 85%	lb.	.11 –	.11½
Gallic, tech	lb.	.45½–	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.13½–	.14
22% tech., light, bbl.	lb.	.06½–	.07
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.09½–	.09¾
Phosphoric, 50% carboys	lb.	.07½–	.07¾
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.26 –	.27
Tartaric, domestic, bbl.	lb.	.29 –	.30
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, wks.	lb.	.27 –	.30
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.89 –	.....
Denatured, 190 proof No. 1, special bbl.	gal.	.61 –	.....
No. 1, 190 proof, special, dr.	gal.	.55 –	.....
No. 1, 188 proof, bbl.	gal.	.65 –	.....
No. 1, 188 proof, dr.	gal.	.58 –	.....
No. 5, 188 proof, bbl.	gal.	.60 –	.....
No. 5, 188 proof, dr.	gal.	.55 –	.....
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.02¾–	.03¼
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.35 –	1.40
Iron free, bags	lb.	2.35 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½–	.12¾
Nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.50 –	3.75
Antimony oxide, white, bbl.	lb.	.13 –	.14
Arsenic, white, powd., bbl.	lb.	.06½–	.06¾
Red, powd., kegs	lb.	.14½–	.15½
Barium carbonate, bbl.	ton	54.00 –	55.00
Chloride, bbl.	ton	64.00 –	70.00
Dioxide, 88%, drums	lb.	.17½–	.18
Nitrate, casks	...	.07½–	.08½
Blanc fixe, dry, bbl.	lb.	.03½–	.03¾
Bleaching powder, f.o.b. wks., drums, contract	100 lb.	1.90 –	.....
Spot, wks., drums	100 lb.	2.00 –	2.15
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.44 –	.46
Calcium acetate, bags	100 lb.	3.00 –	3.05
Arsenate, dr.	lb.	.08 –	.08½
Carbide, drums	lb.	.05 –	.05½
Chloride, fused, dr. wks.	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Phosphate, mono, bbl.	lb.	.06½–	.07½
Carbon bisulphide, drums	lb.	.06 –	.06½
Tetrachloride, drums	lb.	.06½–	.07½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04½–	.....
Contract, tanks, wks.	lb.	.04 –	.....
Cylinders, 100 lb., wks.	lb.	.05½–	.07½
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	15.00 –	16.00
Copper carbonate, bbl.	lb.	.17 –	.17½
Cyanide, drums	lb.	.49 –	.50
Oxide, kegs	lb.	.16 –	.16½
Sulphate, dom., bbl.	100 lb.	4.50 –	4.75
Imp. bbl.	100 lb.	4.50 –	.....
Cream of tartar, bbl.	lb.	.20½–	.21
Epsom salt, dom., bbl.	100 lb.	1.75 –	2.00
Imp., tech., bags	100 lb.	1.35 –	1.40
U.S.P., dom., bbl.	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd.	lb.	.15 –	.16
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Acetate, 99%, dr.	gal.	1.08 –	1.10
Formaldehyde, 40%, bbl.	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.25 –	.....
Fusel oil, ref., drums	gal.	4.50 –	.....
Crude, drums	gal.	3.25 –	3.50
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Imp., bags	100 lb.	.90 –	.95
Glycerine, c. p., drums extra	lb.	.19 –	.19½
Crude 80%, loose	lb.	.12 –	.12½
Hexamethylene, drums	lb.	.66 –	.70
Lead:			
White basic carbonate, dry, casks	lb.	$0.10½–	.....
White, basic sulphate, casks	lb.	.12¾–	.....
White, in oil, kegs	lb.	.1240 –	.....
Red, dry, casks	lb.	.12¾–	.....
Red, in oil, kegs	lb.	1412 –	.....
Acetate, white crys., bbl.	lb.	.15½–	.....
Brown, broken, casks	lb.	.14½–	.....
Arsenate, white crys., bbl.	lb.	.16 –	$0.18
Lime-Hydrated, b.g., wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.11¾–	.....
Lithopone, bags	lb.	.06 –	.06¼
Magnesium carb., tech., bags	lb.	.07 –	.08
Methanol, 95%, drums	gal.	.70 –	.72
97%, drums	gal.	.72 –	.74
Pure, tanks	gal.	.74 –	76
drums	gal.	.78 –	.80
bbl.	gal.	.83 –	.85
Methyl-acetone, t'ks.	gal.	.70 –	.....
Nickel salt, double, bbl.	lb.	.10 –	...
Single, bbl.	lb.	.10½–	...
Orange mineral, csk.	lb.	.15¾–	.15½
Phosgene	...	.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Yellow, cases	lb.	.37½–	.40
Potassium bichromate, casks	lb.	.08¼–	.08½
Bromide, gran., bbl.	lb.	.42 –	.48
Carbonate, 80-85%, calcined, casks	lb.	.06 –	.06¼
Chlorate, powd.	lb.	.06¾–	.08¼
Cyanide, drums	lb.	.47 –	.52
First sorts, cask	lb.	.08¼–	.08½
Hydroxide (caustic potash) drums	lb.	.07½–	.....
Iodide, cases	lb.	3.65 –	3.75
Nitrate, bbl.	lb.	.06 –	.07¾
Permanganate, drums	lb.	.14 –	.15
Prussiate, red, casks	lb.	.36½–	.38
Prussiate, yellow, casks	lb.	.16¾–	.17
Salammoniac, white, gran., casks, imported	lb.	.05¾–	.06
White, gran., bbl., domestic	lb.	.07¼–	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20 –	1.40
Salt cake (bulk) works	ton	16.00 –	18.00
Soda ash, light 58% flat, bulk, contract	100 lb.	1.25 –	.....
bags, contract	100 lb.	1.38 –	.....
Dense, bulk, contract, basis 58%	100 lb.	1.35 –	.....
bags, contract	100 lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	.....
Caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Caustic, solid, 76% f.a.s. N. Y.	100 lb.	2.87½–	3.05
Sodium acetate, works, bbl.	lb.	.05 –	.05¼
Bicarbonate, bulk	100 lb.	1.75 –	.....
Bichromate, casks	lb.	.06½–	.06¾
Bisulphate (niter cake)	ton	6.00 –	7.00
Bisulphite, powd., U.S.P., bbl.	lb.	.04¼–	.04½
Bromide, bbl.	lb.	.43 –	.47
Chlorate, kegs	lb.	.06½–	.06¾
Chloride	long ton	12.00 –	13.00
Cyanide, cases	lb.	.19 –	.22
Flouride, bbl.	lb.	.08¾–	.09
Hyposulphite, bbl.	lb.	.02¼–	.02½
Nitrite, casks	lb.	.09¼–	.09⅜
Peroxide, powd., cases	lb.	.23 –	.27
Phosphate, dibasic, bbl.	lb.	.03½–	.03¾
Prussiate, yel. bbl.	lb.	.09¼–	.09⅜
Salicylate, drums	lb.	$0.38 –	$0.40
Silicate (40°, drums)	100 lb.	.75 –	1.16
Silicate (60°, drums)	100 lb.	1.75 –	2.00
Sulphide, fused, 60-62%, drums	lb.	.02¾–	.03¼
Sulphite, crys., bbl.	lb.	.03¼–	.03½
Strontium nitrate, powd., bbl	lb.	.09 –	.09½
Sulphur chloride, yel drums	lb.	.04½–	.05
Crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Flour, bag	100 lb.	2.25 –	2.35
Dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb	.15½–	....
Oxide, bbl.	lb.	.58 –	.58½
Crystals, bbl.	lb.	.38½–	.....
Zinc carbonate, bags	lb.	.12 –	.14
Chloride, gran., bags	lb.	.06 –	.07½
Cyanide, drums	lb.	.40 –	.41
Dust bbl.	lb.	.08 –	.08½
Oxide, lead free, bags	lb.	.07⅜–	.....
5% lead sulphate bags	lb.	.06⅞–	.....
French, red seal, bags	lb.	.09⅜–	.....
French, green seal, bags	lb.	.10⅜–	.....
French, white seal, bbl.	lb.	.11⅞–	.....
Sulphate, bbl.	100 lb.	3.25 –	3.50

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.62
Alpha-naphthol, ref., bbl.	lb.	.75 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.21 –	.22
Anthracene, 80%, drums	lb.	.65 –	.70
Anthraquinone, 25%, drums	lb.	.65 –	.70
Benzaldehyde U.S.P., tech., drums	lb.	.69 –	.71
Benzene, pure, tanks, works	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl.	lb.	.78 –	.80
Benzyl chloride, ref. carboys	lb.	.35 –	.....
Benzyl chloride, tech., drums	lb.	.25 –	.....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresylic acid, 97%, drums	gal.	.62 –	.64
95-97%, drums, works	gal.	.57 –	.59
Dichlorbenzene, drums	lb.	.07 –	.08½
Dinitrobenzene, bbl.	lb.	.15 –	.17½
Dinitrochlorbenzene, bbl.	lb.	.20 –	.21
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
H-acid, bbl.	lb.	.70 –	.74
Meta-phenylenediamine, bbl.	lb.	.90 –	.95
Monochlorbenzene, drums	lb.	.08½–	.10
Naphthalene, flake, bbl.	lb.	.05 –	.05½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.05 –	1.15
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	.11
Ortho-toluidine, bbl.	lb.	.17 –	.18
Para-aminophenol, base, kegs	lb.	1.15 –	1.20
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Para-nitraniline, bbl	lb.	.65 –	.67
Para-nitrotoluene, bbl.	lb.	.40 –	.42
Para-phenylendiamine, bbl.	lb.	1.30 –	1.35
Para-toluidine, bbl.	lb.	.75 –	.80
Phenol, U.S.P., dr.	lb.	.24 –	.26
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	4.00 –	4.15
Resorcinol, tech., kegs	lb.	1.30 –	1.40
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl.	lb.	.50 –	.55
Salicylic acid, tech., bbl.	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl.	lb.	.35 –	.....
Solvent naphtha, water-white, tanks	gal.	.24 –	.25
Crude, tanks	gal.	.21 –	.22
Sulphanilic acid, crude, bbl.	lb.	.16 –	.18
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	.....
Toluene, drums, works	gal.	.31 –	.....
Xylidine, drums	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.38 –	.40
Xylene, com., tanks	gal.	.25 –	.27

Naval Stores

Rosin B-D, bbl.	280 lb.	$7.50 –	$7.55
Rosin E-I, bbl.	280 lb.	7.50 –	7.55
Rosin K-N, bbl.	280 lb.	7.55 –	7.60
Rosin W.G.-W.W., bbl.	280 lb.	8.65 –	9.20
Turpentine, spirits of, bbl.	gal.	.84 –	.84½
Wood, steam dist., bbl.	gal.	.78 –	.79
Wood, dest. dist., bbl.	gal.	.70 –	.74
Pine tar pitch, bbl.	200 lb.	5.50 –	.....
Tar, kiln burned, bbl.	500 lb.	12.00 –	12.50
Rosin oil, first run, bbl.	gal.	.45 –	.....
Pine tar oil, com'l.	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl	lb.	$0.03½–	$0.05½
Grease, yellow, loose	lb.	.09 –	.09½
Lard oil, Extra No. 1, bbl	gal.	.96 –	.98
Lard compound, bbl	lb.	.13½–	.13¾
Neatsfootoil, 20 deg. bbl	gal.	1.35 –	1.37
Oleo Stearine	...	.12 –	.....
Oleo oil, No. 1, bbl	lb.	.16½–	.17
Red oil, distilled, d.p. bbl	lb.	.11¼–	.11¾
Tallow, extra, loose works	lb.	.10½–	.....
Tallow oil, acidless, bbl	gal.	.92 –	.94

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.17 –	$0.17¼
Castor oil, No. 1, bbl	lb.	.17½–	.17¾
Chinawood oil, bbl	lb.	.15½–	.15¾
Coconut oil, Ceylon, bbl	lb.	.11½–	.11¾
Ceylon, tanks, N. Y.	lb.	.10¾–	.....
Corn oil, crude, bbl	lb.	.12¼–	.12½
Crude, tanks, (f.o.b. mill)	lb.	.10¾–	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09¼–	.09½
Summer yellow, bbl	lb.	.11¼–	.....
Linseed oil, raw, car lots, bbl.	gal.	1.11 –	.....
Raw, tank cars (dom.)	gal.	1.05 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.13 –	.....
Olive oil, denatured, bbl	gal.	1.18 –	1.22
Sulphur, (foots) bbl	lb.	.09¼–	.09¾
Palm, Lagos, casks	lb.	.09¼–	.09¾
Niger, casks	lb.	.08¾–	.08¾
Palm kernel, bbl	lb.	.10¼–	.10½
Peanut oil, crude, tanks (mill)	lb.	.11¾–	.12
Refined, bbl	lb.	.16 –	.16½
Perilla, bbl	lb.	.14½–	.14¾
Rapeseed oil, refined, bbl	gal.	.97 –	.98
Sesame, bbl	lb.	.14¼–	.14½
Soya bean (Manchurian), bbl	lb.	.13½–	.....
Tank, f.o.b. Pacific Coast	lb.	.11¾–	.....

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.64 –	$0.66
Menhaden, light pressed, bbl.	gal.	.70 –	.72
White bleached, bbl	gal.	.72 –	.74
Crude, tanks (f.o.b. factory)	gal.	.53½–	.55
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl	gal.	.75 –	.76
Winter, bleached, bbl	gal.	.78 –	.79

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.90 –	.95
Cochineal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½–	.05
Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags	100 lb.	4.52 –	4.79
Gum, bags	100 lb.	4.82 –	5.09
Divi-divi, bags	ton	42.00 –	43.00
Fustic, sticks	ton	30.00 –	35.00
Chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.18 –	.18½
Logwood, sticks	ton	25.00 –	26.00
Chips, bags	lb.	.02½–	.03
Sumac, leaves, Sicily, bags	ton	165.00 –	175.00
Domestic, bags	ton	50.00 –	55.00
Starch, corn, bags	100 lb.	3.87 –	4.14

Extracts

Archil, conc., bbl	lb.	$0.16 –	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½–	.02½
Divi-divi, 25% tannin, bbl	lb.	.05 –	.05
Fustic, liquid, 42°, bbl	lb.	.08 –	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.13½–	.14
Hematine crys., bbl	lb.	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.03½–	.04
Hypernic, liquid, 51°, bbl	lb.	.12 –	.13
Logwood, crys., bbl	lb.	.14 –	.15
Liq., 51°, bbl	lb.	.07½–	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Quebracho, solid, 65% tannin, bbl	lb.	.04½–	.04¾
Sumac, dom., 51°, bbl	lb.	.06½–	.06¾

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract	lb.	$0.08 –	$0.11
spot, cases	lb.	.11 –	.16
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues-Prussian, bbl	lb.	.35 –	.37
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.05 –	.12
Sienna, Domestic, bbl	lb.	.03 –	.03½
Umber, Turkey, bbl	lb.	.04 –	.04½
Greens-Chrome, C.P.Light, bbl	lb.	.28 –	.30
Chrome, commercial, bbl	lb.	.10½–	.11½
Paris, bulk	lb.	.24 –	.26
Reds, Carmine No. 40, tins	lb.	4.25 –	4.50
Iron oxide red, casks	lb.	.08 –	.12
Para toner, kegs	lb.	.95 –	1.00
Vermilion, English, bbl	lb.	1.25 –	1.30
Yellow, Chrome, C.P. bbls	lb.	.17 –	.17½
Ocher, French, casks	lb.	.02 –	.03

Waxes

Beeswax, crude, Afr. bg	lb.	$0.33 –	$0.33½
Refined, light, bags	lb.	.36 –	.37
Candellila, bags	lb.	.30 –	.30½
Carnauba, No. 1, bags	lb.	.36 –	.37
No. 2, North Country, bags	lb.	.29 –	.29½
No. 3, North Country, bags	lb.	.24 –	.25
Japan, cases	lb.	$0.15½–	$0.15¾
Montan, crude, bags	lb.	.06 –	.06½
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.06 –	.06½
Crude, scale 124-126 m.p. bags	lb.	.05¾–	.....
Ref., 118-120 m.p. bags	lb.	.05½–	.06
Ref., 123-125 m.p., bags	lb.	.06 –	.06½
Stearic acid, sgle. pressed, bags	lb.	.11¾–	.12½
Double pressed, bags	lb.	.12½–	.12¾

Fertilizers

Acid phosphate, 16%, wks.	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.75 –	.....
Blood, dried, bulk	unit	3.85 –	3.95
Bone, raw, 3 and 50, ground.	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.75 –	.....
Nitrate of soda, bags	100 lb.	2.47½–	2.50
Tankage, high grade, f.o.b. Chicago	unit	3.00 –	3.25
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.00 –	3.50
Tennessee, 75%	ton	6.50 –	6.75
Potassium muriate, 80%, bags	ton	34.55 –	.....
Sulphate, bags, 90%	ton	45.85 –	.....
Double manure salt, bgs.	ton	26.35 –	.....
Kainit, 14%, bgs	ton	10.25 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.36½–	$0.36¾
Upriver coarse	lb.	.26¾–	.27
Plantation—First latex crepe	lb.	.37½–	.....
Ribbed smoked sheets	lb.	.37½–	.....

Gums

Copal, Congo, amber, bags	lb.	$0.08 –	$0.10
East Indian, bold, bags	lb.	.13 –	.14
Manila, amber, bags	lb.	.14 –	.16
Damar, Batavia, cases	lb.	.27½–	.28
Singapore, No. 1, cases	lb.	.29 –	.29½
Singapore, No. 2, cases	lb.	.20 –	.21
Kauri, No. 1, cases	lb.	.58 –	.64
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.06 –	.12

Shellac

Shellac, orange fine, bags	lb.	$0.66 –	$0.67
Orange superfine, bags	lb.	.68 –	.69
Bleached, bonedry	lb.	.74 –	.75
T. N., bags	lb.	.63 –	.64

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh. ton	$300.00–	$350.00
Shingle, f.o.b., Quebec	sh. ton	45.00 –	50.00
Cement, f.o.b., Quebec	sh. ton	15.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	17.00 –	17.50
Grd., off-color, f.o.b., Balt	net ton	13.00 –	14.00
Floated, f.o.b., St. Louis, bbl	net ton	23.00 –	24.00
Crude f.o.b. mines, bulk	net ton	8.50 –	9.00
Casein, bbl., tech.	lb	.10½–	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga	net ton	6.50 –	8.00
Powd., f.o.b. Ga	net ton	12.00 –	16.00
Crude, f.o.b. Va	net ton	5.50 –	7.00
Ground, f.o.b. Va	net ton	10.00 –	20.00
Imp., powd	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 –	7.25
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 gr'd. Me.	long ton	19.00 –	20.00
No. 1 Can., f.o.b., mill, powd	long ton	25.00 –	.....
Graphite, Ceylon, lump, first quality, bbl	lb.	.05½–	.06
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.12 –	.12¼
Tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.15 –	1.20
Kieselguhr, f.o.b. Cal	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, calcined	ton	35.00 –	42.50
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl	lb.	.06 –	.08
Dom., ground, bbl	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.25
Sand blast, f.o.b. Ind.	ton	2.25 –	3.50
Amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Glass sand, f.o.b. Ill.	ton	2.00 –	2.25
Soapstone, coarse, f.o.b., Vt., bags	ton	7.00 –	7.50
Talc. 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	.....
200 mesh, f.o.b., Ga.	ton	8.50 –	10.00
325 mesh, f.o.b. New York, grade A	ton	14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 –	$2.85
Corning	bbl.	1.50 –	.....
Cabell	bbl.	1.45 –	.....
Somerset	bbl.	1.55 –	.....
Illinois	bbl.	1.37 –	.....
Indiana	bbl.	1.38 –	.....
Kansas and Okla. under 28 deg.	bbl.	.75 –	.85
California, 35 deg. and up	bbl.	1.40 –	...

Gasoline, Etc.

Motor gasoline steel bbls	gal.	$0.15 –	.....
Naphtha, V. M. & P. deod, steel bbls	gal.	.14 –	.....
Kerosene, ref. tank wagon	gal.	.13 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.08½–	.....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.34 –	$0.35
Bloomless, 30@31 grav.	gal.	.24 –	.....
Paraffin, pale 885 vis	gal.	.16½–	.17
Spindle, 200, pale	gal.	.25–	.26
Petrolatum, amber, bbls	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–43
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	33–37
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
9-in. sizes, f.o.b., Birmingham.	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	33–35
Silicon carbide refract brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls	ton	$200.00 –	......
Ferrochromium, per lb. of Cr, 1-2% C	lb.	.30 –	......
4-6% C	lb.	.10½–	.11
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	105.00 –	......
Spiegeleisen, 19-21% Mn.	gr. ton	32.00 –	33.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	1.80 –	2.00
Ferrosilicon, 10-12%	gr. ton	39.50 –	43.50
50%	gr. ton	72.00 –	75.00
Ferrotungsten, 70-80% per lb. of W	lb.	.85 –	.90
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	......
Ferrovanadium, 30-40%, per lb. of V	lb.	3.25 –	4.00

Ores and Mineral Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	.....
C.i.f. Atlantic seaboard	ton	18.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	4.00 –	4.50
Coke, furnace, f.o.b. ovens	ton	3.25 –	3.30
Fluorspar, gravel, f.o.b. mines, Illinois	ton	17.50 –	18.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½–	.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.39 –	.41
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite 85% MoS_2, per lb. Mo S_2, N. Y.	lb.	.65 –	.75
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½ –	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 –	.....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	.....
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten ore, scheelite, 60% WO_3 and over	unit	9.00 –	9.25
Tungsten, wolframite, white, 60% WO_3	unit	8.85 –	9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	12.50
Vanadium pentoxide, 76%	lb.	3.00 –	3.25
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.14½– $0.14¾
Aluminum, 98 to 99%	lb.	.27 – .28
Antimony, wholesale, Chinese and Japanese	lb.	.14¾– .14½
Nickel, 99%	lb.	.29 – 33
Monel metal	lb.	.32
Tin, 5-ton lots, Straits	lb.	.54¾
Lead, New York, spot	lb.	.09
Zinc, spot, New York	lb.	.0755
Silver (commercial)	oz.	.69½
Cadmium	lb.	.60– .62
Bismuth (508 lb. lots.)	lb.	1.50–1.55
Cobalt	lb.	2.50–3.00
Magnesium, ingots, 99%	lb.	.90–95
Platinum, refined	oz.	117.00
Mercury 75	lb.	70.00–70.50
Tungsten powder	lb.	.95–1.00

Industrial Developments of the Week

New Construction and Machinery Requirements in the Process Industries

Some Opportunities This Week

Canning	Cumberland, Wis.
Cement	Toledo, O.
Enamelware	Chattanooga, Tenn.
Fish Meal	Halifax, N. S.
Glass	St. Louis, Mo.
Lard Refining	Memphis, Tenn.
Lime	Limerock, R. I.
Oil and Gasoline	Tillsonburg, Ont.
Paper	Hamilton, O.
Paper	Thomson, N. Y.
Pulp and Paper	St. Joseph d'Alma, Que.
Paper	Sillery, Que.
Rubber	Oakville, Conn.
Rubber	Akron, O.
Steel	Massillon, Ohio

New England

Conn., Oakville — Autotyre Co. has awarded the contract for the construction of a 4 story, 60 x 180 ft. factory, to Tracy Bros., Waterbury; estimated cost $175,000.

R. I., Limerock—The Burton K. Harris Lime Co. plans to rebuild its plant recently destroyed by fire. Estimated cost $50,000.

Middle Atlantic

N. J., Elizabeth—The Singer Manufacturing Co. has awarded the contract for a 1 story addition to be used as an electric annealing plant, to Bentley & Morrison Co., 120 Broad St.; estimated cost $50,000.

N. Y. Thomson—The Iroquois Paper Co. has awarded the contract for a 2 story, 60 x 100 ft. addition to its paper mill for pulp manufacture, to J. W. Hennessey, Saratoga Springs.

South

Ala., Cordova—Cordova Brick & Tile Corp., recently organized with M. Aaron, Pres., Cordova; J. Edmundson, Secy., First Natl. Bank, Bldg., Birmingham, plans the construction of a plant and will install machinery, etc. The company has about 400 acres of coal, shale and clay property with some 2,000,000 tons of buff burning clay stripped off ready for loading.

Fla., Jacksonville—L. C. Rivas, Jacksonville, plans the construction of a cement plant and warehouse, between Roselle and Travis Sts., about the first of the year.

Ga., Atlanta—The School of Technology, will soon award the contract for the construction of a chemistry building. Pringle & Smith, Atlanta Trust Company Bldg., associated architects.

Tenn., Alton Park—Tennessee Bauxite Brick Co., Chattanooga, recently incorporated, plans the construction of a plant for production of bauxite brick, to be used in furnaces operating at high temperature.

Tenn., Chattanooga—Crane Enamelware Co., 14th and Chestnut Sts., subsidiary of Crane Co., Chicago, has had plans prepared for the construction of a 1 story, 190 x 200 ft. addition to its plant.

Tenn., Memphis — Swift & Co., Union Stockyards, Chicago, Ill., plan the construction of a lard refining plant. Estimated cost about $70,000.

This page is of value not only as a machinery market but also as an index of the general activity and growth of the industries served by Chem. & Met. The reports are gathered by our regular correspondents who are instructed to verify every detail. Requirements for new machinery will be published here free of charge.

Middle West

O., Akron—Goodyear Tire and Rubber Co., G. M. Stadelman, Pres., has awarded the contract for the construction of 5 story and basement, 160 x 530 ft., factory to Hunkin-Conkey Constr. Co., Hunkin-Conkey Bldg., Cleveland. Estimated cost $200,000.

O., Hamilton — Champion Coated Paper Co., T. G. Thomson, Pres., is having plans prepared for the construction of a 1 story addition to its plant. Estimated cost $85,000. R. G. Mueller and W. R. Hare, Rentschler Bldg., are associated architects.

O., Massillon—The Central Steel Co., R. E. Bebb, Pres., has awarded the contract for the steel work for the proposed blast furnace and power plant to the Riter-Conley Co., Oliver Bldg., Pittsburgh, Pa., $5,000,000. The company will expend about $10,000,000 on the entire project.

O., Toledo—Cement Products & Supply Co., 367 Northern Blvd., plans the construction of a 1 story, 60 x 100 ft. plant.

Wis., Cambria—Cambria Canning Co., H. Schimmell, Pres., awarded the contract for the construction of a 3 story, 54 x 100 ft. cannery to J. Kumm, Columbus. Estimated cost $150,000. Canning and conveying machinery will be required.

Wis., Cumberland — The Fame Canning Co., 111 West Washington St., Chicago, Ill., has awarded the contract for the construction of a 3 story cannery, to the Nyman Construction Co., Cumberland; estimated cost $125,000. The company is in the market for canning and conveying machinery.

West of Mississippi

Mo., St. Louis — Mississippi Glass Co., 4070 North First St., will build a 1 story, 62 x 208 ft., glass plant on First St., by day labor. Estimated cost $45,000. Carey & Esselstyne, 602 Hoffman Bldg., Detroit, Mich., are architects.

Mo., St. Louis — W. Waltke & Co., 161 East Grand Ave., awarded the contract for the construction of a 92 x 97 ft. grease house for the soap works.

Okla., Bartlesville — Phillips Petroleum Co. has acquired plants, etc., of Landreth Gasoline Co., Landreth Gas Co. and the Landreth Production Co., Ibex field near Breckenridge, Texas, for $4000,000. The Purchasing company plans an expansion and improvement program including extensions and improvements to local plants.

Canada

N. S., Halifax—The National Fish Co., Arthur Boutilier, Pres., is in the market for machinery for a new plant which will be used for the manufacture of fish meal.

Ont., Courtland — City Dairy Co., Ltd., Spadina Crescent, Toronto, having plans prepared by Gore, Nasmith & Storrie, Engrs., Confederation Life Bldg., Toronto, for construction of a powdered-milk factory. Estimated cost $30,000.

Ont., Tillsonburg—The Regal Oil Corporation is having plans prepared by W. B. Brooks, Engr., c/o Company, for a plant for the manufacture of oil and gasoline. Estimated cost $100,000. The company is interested in prices for complete machinery and equipment.

Que., St. Joseph d'Alma—Price Bros., Ltd., 73 St. Peter St., have awarded the contract for the construction of a pulp and paper mill to W. I. Bishop, Ltd., 10 Cartcart St., Montreal. Estimated cost, $2,000,000.

Que., Sillery—The Quebec Paper Co., Ltd., 71 St. Peter St., recently chartered with $13,500,000 capital stock, is having plans prepared for a pulp and paper mill; estimated cost $2,000,000. Frank W. Clarke is president.

Unverified

Fla., Jacksonville—Z. B. Hayzlin, plans the construction of a factory for manufacture of the tile and concrete.

Ind., East Chicago—Sinclair Oil Co. is making plans for the construction of extensions to its local refinery including additional equipment.

Kentucky — Aluminum Company of America, Oliver Bldg., Pittsburgh, Pa., is reported to have acquired one of the three large fluorspar mines in the Illinois section of the Illinois-Kentucky fluorspar field and about 15 smaller properties in the Kentucky section.

N. J., Jersey City — Fire recently destroyed the plant of the Manufacturers' Oxygen Co., at Terhune and West Side Aves. The loss is estimated at $140,000. William J. Hobert is manager.

Incorporations

Anson Brick & Tile Co., Lilesville, N. C., increased capital from $30,000 to $100,000.

National Varnish Co., New York, 1,000 shares $100 each to 11,000 shares of which 5,000 shares are class A preferred, $100 each; 3,000 class B preferred, no par value, and 3,000 common, no par value.

Pulp Bleaching Corp., New York City, 1,500 shares preferred stock, $100 each; 1,000 common, no par value. R. B. Wolf, R. P. Hill. (Attorney, B. L. Blauvelt, 99 Nassau St.)

Taggart Bros Co., Watertown, N. Y., mining and chemical, 10,000 shares preferred stock, $100 each; 100,000 common, no par value. B. B. Taggart, Del Andrews, J. J. M. Scandrett. (Attorneys, Taggart Bros., Watertown).

The Thompson Specialties Co., Inc., Springfield, Mass.; chemicals; capital $180,000. Henry O. Thompson and Theodore C. Lette, Longmeadow, and Charles H. Seltzer, Springfield.

Standard Chemical Products Co., Dover, Del.; manufacture and sale of mineral and chemical products; $2,000,000.

W. S. & L. Manufacturing Corp., Wilmington, Del., chemists and dyemakers, $300,000. (Colonial Charter Co.)

West Virginia Pulp & Paper Co., New York, $8,000,000 to $125,000,000.